

# Chemical Age

Simon-Carves and  
Monsanto Link on  
Effluent Service  
(page 235)

VOL. 84 No. 2144

13 August 1960

THE WEEKLY NEWSPAPER OF THE CHEMICAL INDUSTRY

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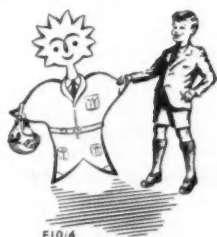


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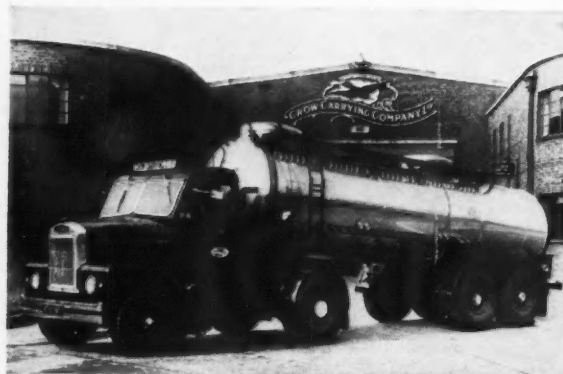
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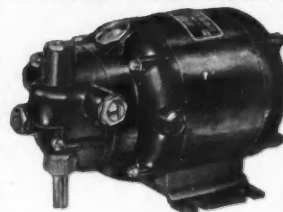
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300 16 oz. in.	25 4 lb. in.
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100 32 oz. in.	12.5 4 lb. in.
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108 7 oz. in.	9 30 oz. in.
54 10 oz. in.	6.7 35 oz. in.
36 12 oz. in.	4.5 44 oz. in.
27 15 oz. in.	3.35 3 lb. in.
18 20 oz. in.	2.25 4 lb. in.

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50-150 20 oz. in.	6-16.5 4 lb. in.
32-100 32 oz. in.	4-11 4 lb. in.
25-75 40 oz. in.	3-8.25 4 lb. in.
16-50 48 oz. in.	2-5.5 4 lb. in.

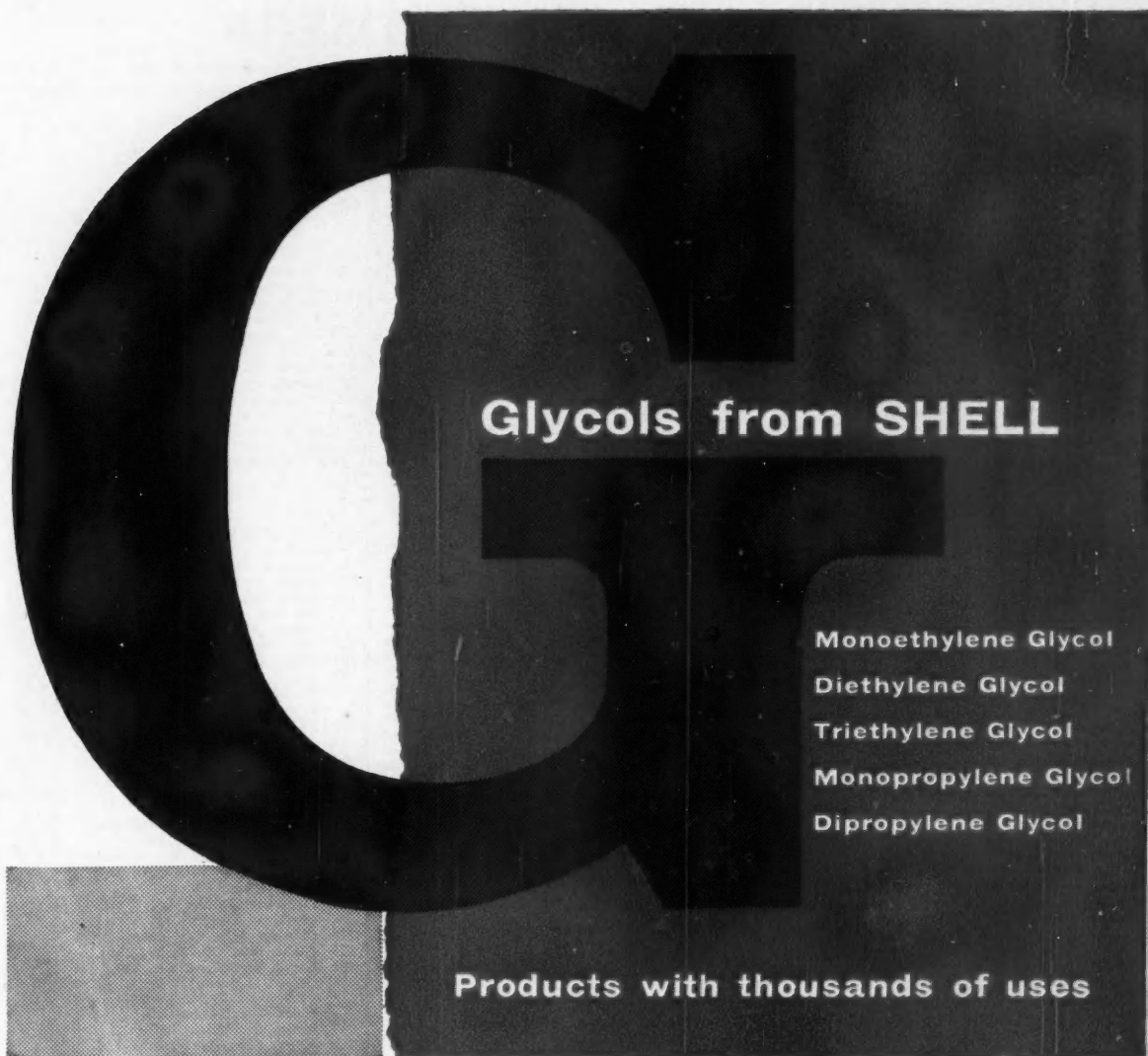
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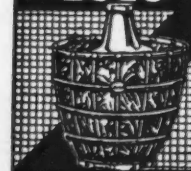
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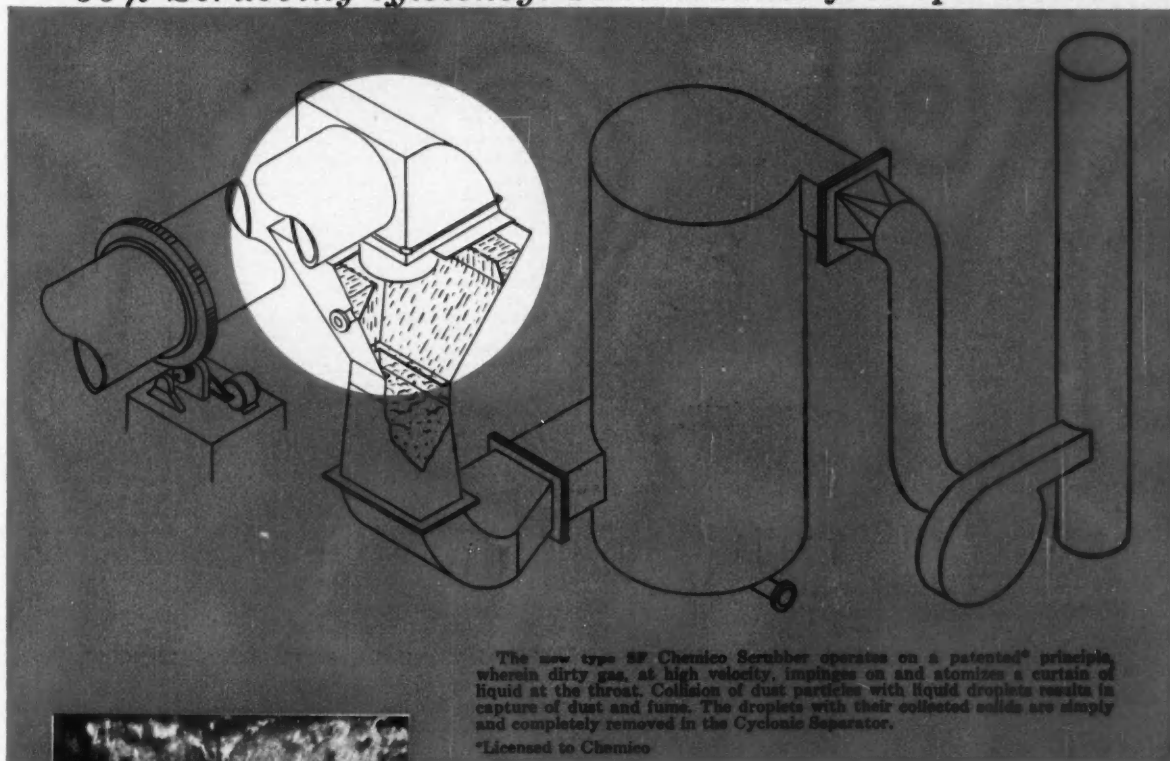
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*Actual photograph of throat action*

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NUMBER ONE



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<b>1</b> Propylene dichloride (1:2-Dichloropropane) Liquid. B.Pt. 96.5°C.	Powerful solvents for fats, waxes and a wide range of organic products; these chemicals may be considered as useful start-points for the synthesis of many chemical products.	Tonnage quantities
<b>2</b> Dichlorodisopropyl ether Liquid. B.Pt. 187°C.		45 gallon drum lots
<b>3</b> Dipropylene glycol Liquid. B.Pt. 232°C.	Intermediate for polyester resins—for the formulation of hydraulic fluids, and for solvent separation of organic compounds; has important humectant properties and may be used to plasticise cork and paper.	45 gallon drum lots
<b>4</b> Mixture of dipropylene glycol and higher propylene glycols (not refined)	Suggested as plasticisers for jointing compounds; may also be used for gas dehydration and de-icing fluids.	Tonnage quantities

## Phenols and Related Products

<b>5</b> Cumylphenol (p-( $\alpha$ : $\alpha$ -dimethylbenzyl) phenol) Solid. M.Pt. 72-73°C.	Newly developed intermediate for special oil-soluble 100% phenolic resins and surface coatings of outstanding flexibility, durability and resistance to acids and alkalis. Useful organic chemical intermediate.	1 lb. samples
<b>6</b> Dodecylphenol (a mixture of isomeric p-dodecylphenols) Viscous liquid. 5%-95% boils at 320-335°C. at atmos. press.	An important intermediate for nonionic and anionic surface-active agents. Also for plasticisers, oil additives, resins, rubber chemicals.	1 lb. samples
<b>7</b> 2:5 Xylenol 80/90% 25.M content. Solid. M.Pt. 60-70°C.	Intermediate for varnish resins, plasticisers, adhesive resins, weedkillers, antiseptics.	Tonnage quantities

## Butylated Phenols

<b>8</b> 3-Methyl-4:6 ditertiary butylphenol (3M46B) Solid. M.Pt. 56-58°C.	Have wide applications in the rubber and plastics fields as well as other specified uses.	Technical grade. Tonnage quantities
<b>9</b> 3-Methyl-6-tertiary butylphenol (3M6B) Solid. M.Pt. 21-22°C.		Refined grade. Tonnage quantities
<b>10</b> 4-Methyl-2-tertiary butylphenol (4M2B) Solid. M.Pt. 50-51°C.		
3M6B and 4M2B have antioxidant properties themselves or can be intermediates for antioxidants in the rubber, plastics and petroleum fields. They are useful raw materials for resins, oil additives and rubber chemicals. In addition 3M6B and certain derivatives can be used as disinfectants, and it is also an intermediate for musk ambrette. 3M46B is of particular interest as an intermediate for reclaiming agents for rubber. It may be of interest in resins, plasticisers and surface-active agents.		
<b>11</b> 2:4-Ditertiary butylphenol (2:4B) Solid. M.Pt. 53-54°C.	Of interest as an intermediate for surface-active agents and oil additives. Effective as a stabiliser for ethylcellulose.	1 lb. samples. Enquiries welcome for tonnage quantities

## Organic Acids and Anhydrides

<b>12</b> Isophthalic acid	Superior alkyd resins may be derived from isophthalic acid; it is important for high quality speciality polyester resins—and is also of interest for plasticisers.	8 oz. samples. Enquiries welcome for cwt. lots
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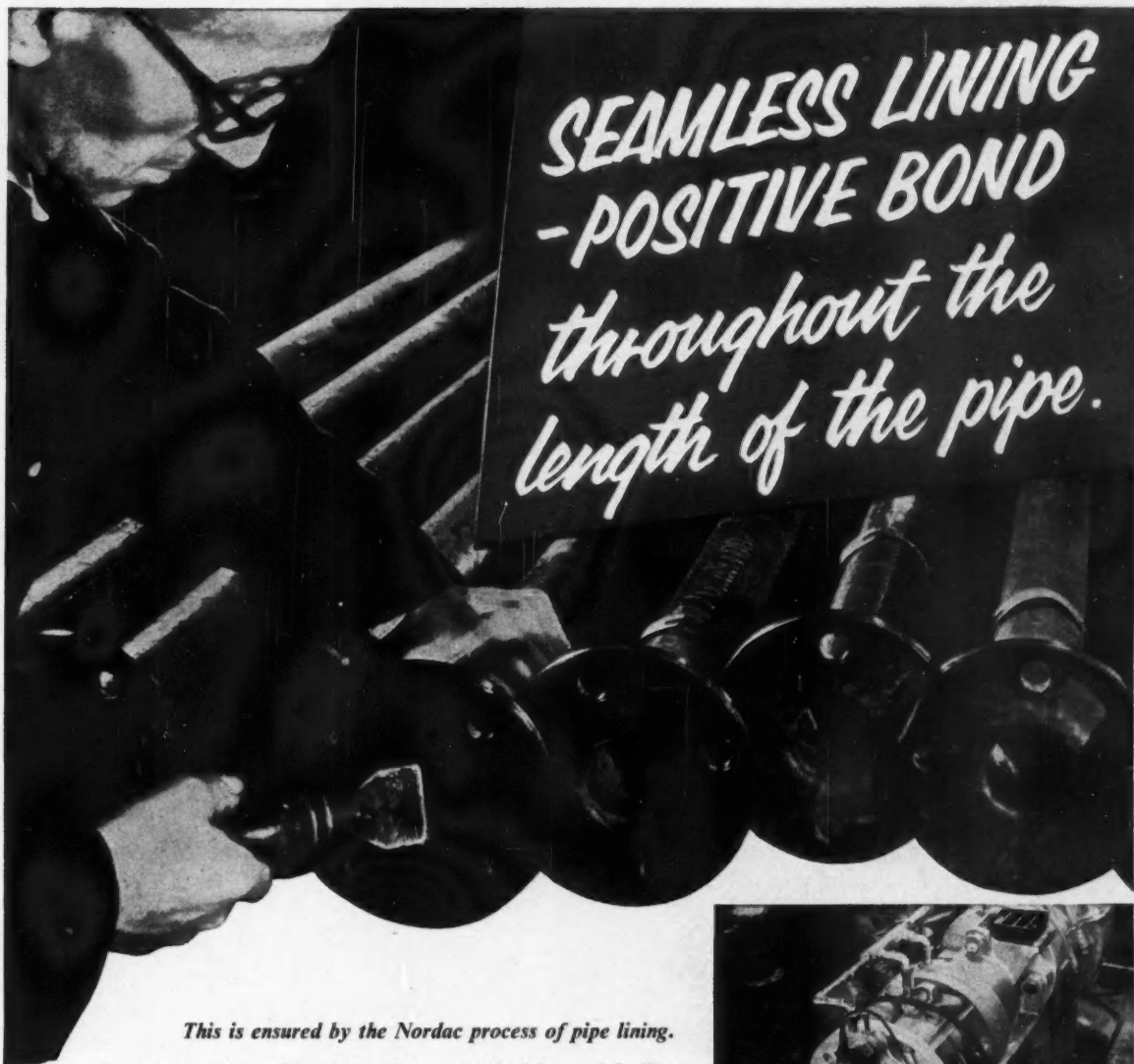
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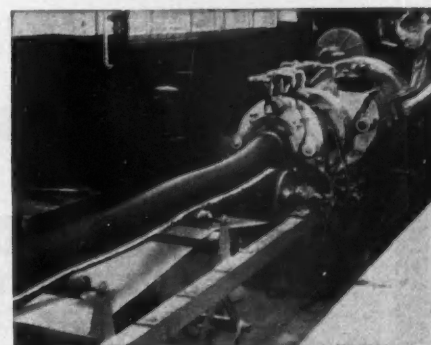
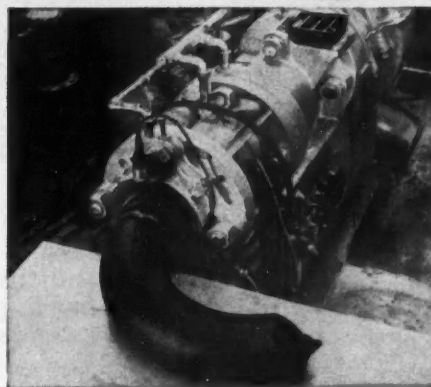
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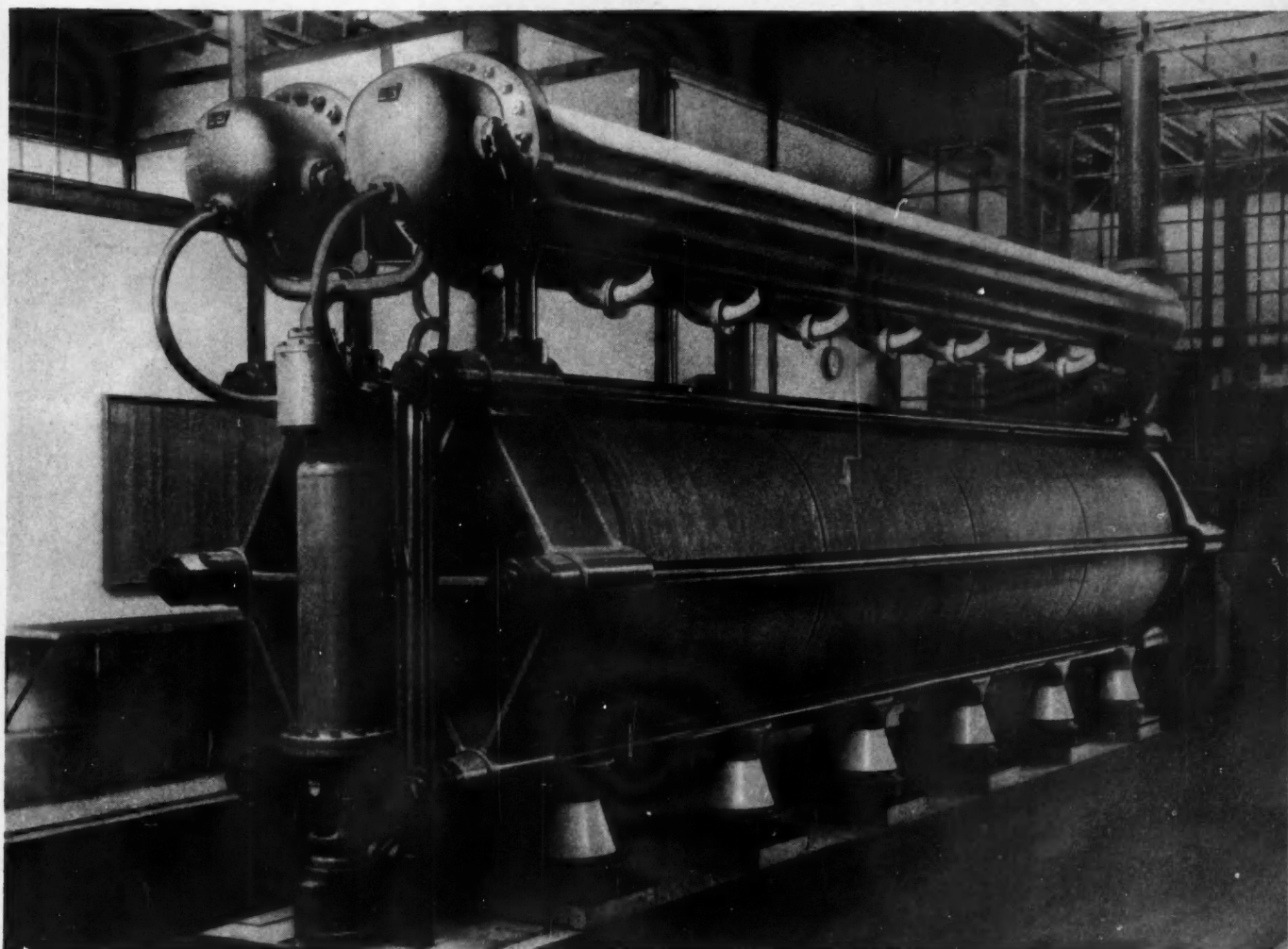
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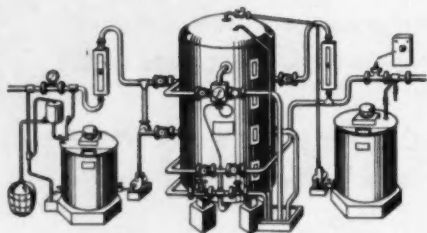
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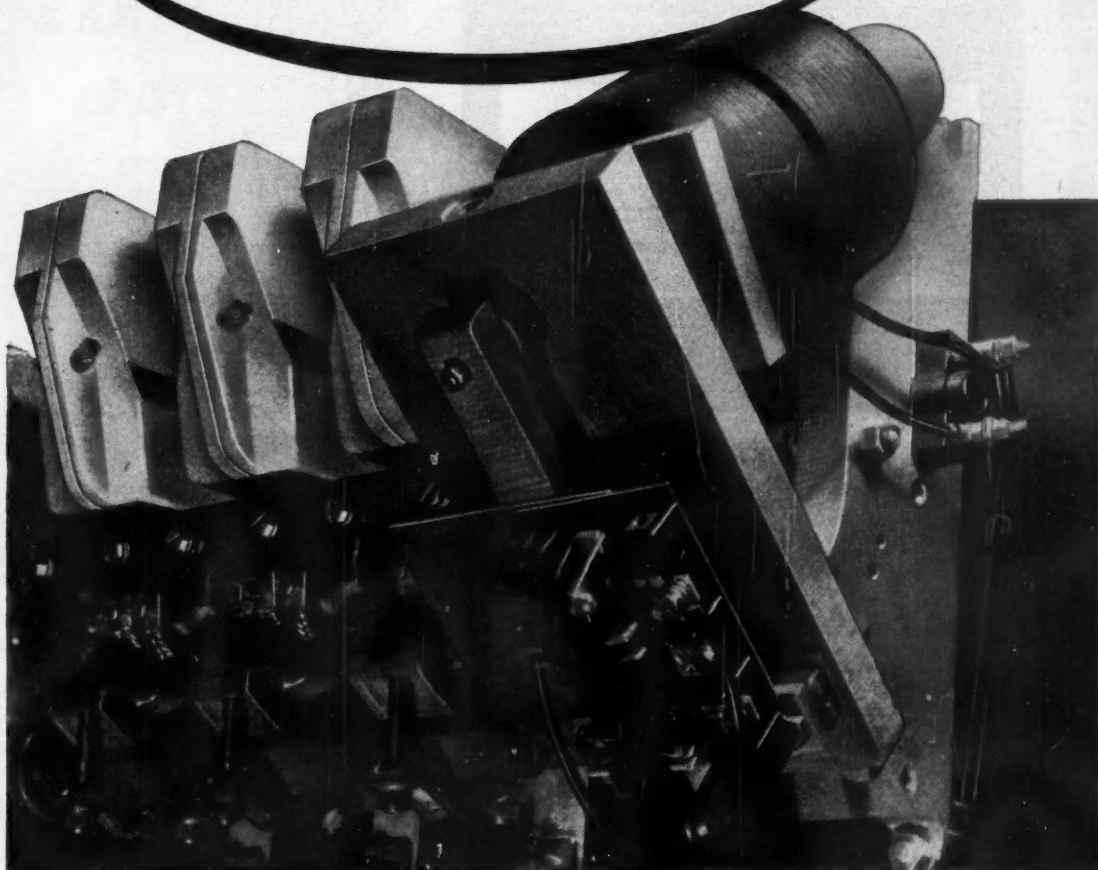
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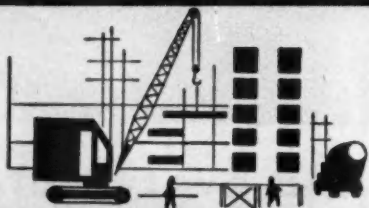


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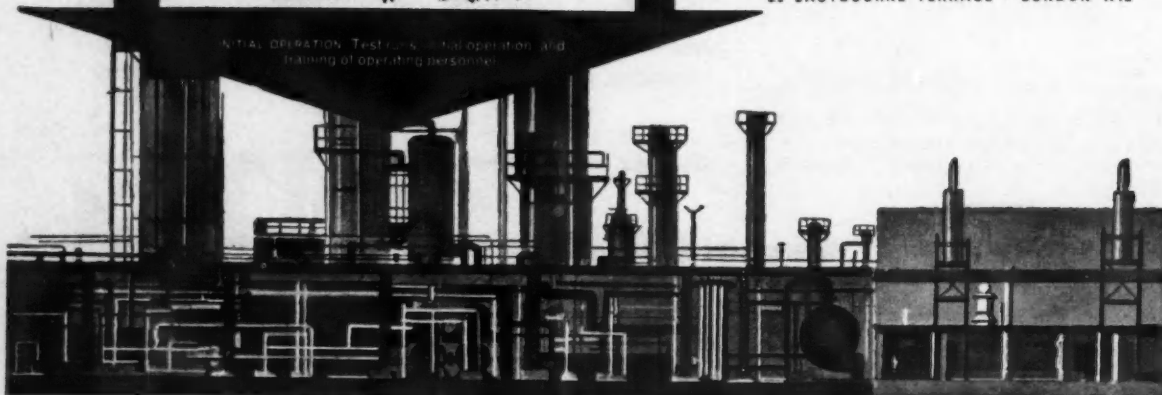
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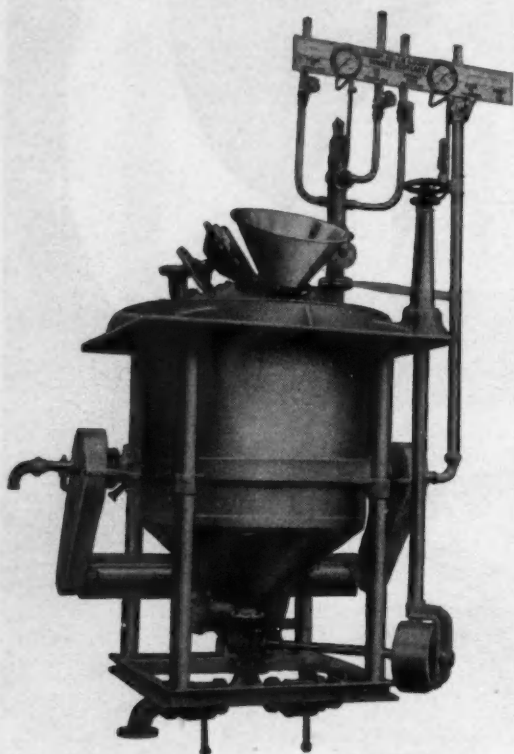
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# CHEMICAL AGE

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## U.K. CHEMICAL EXPORTS

**S**IGNIFICANT feature of Britain's trade in chemicals in the first six months of 1960 is not so much that exports are running at their highest ever levels, but that imports have been increasing at a proportionally much faster rate. Exports of all chemicals and allied materials in the period January to June totalled £160,024,861, a 12.4% increase over the same period of 1959 when the total was £142,251,867. For the first half of this year, chemical imports were valued at £87,491,211, an increase of 40.3% over the 1959 figure of £62,340,429.

While this country's chemical exports have shown a healthy increase, it seems that our share of the growing world demand for chemical products has been rising at a lower rate than is the case with some other countries. While U.K. trade in chemicals to the Common Market countries has risen by 21.2% in the first half of this year, imports from the 'Six' were 34.5% higher. Similarly with the members of the European Free Trade Association; U.K. exports have risen by 17.8%, but imports from the 'Outer Seven' are 26.6% higher (see tables below).

The new pattern of trade in chemicals with the U.S., first referred to in CHEMICAL AGE, 9 July, p. 53, continues. For the first half of this year, shipments from the U.K. to that country were 0.17% higher than in the first six months of 1959; imports from the U.S. over the same period rose to a value of £24.5 million, a 67.7% increase. (In the light of their export successes, it is, perhaps, difficult to see why U.S. chemical producers are so clamorous in their demands for greater protection.) Imports from Canada were higher by 38%, while our shipments to Canada, valued at £4.14 million were down by some £220,000.

A big proportion of Canada's chemical trade with the U.K. is in the form of plastics materials and our imports during the first half of this year were valued at £1,419,000, an increase of 386% over the £292,189 figure of last year. The U.K. imported £4,442,000 worth of plastics materials from the U.S., an increase of 50.5%. Total plastics imports were worth £15 million, a rise of 67% over January-June 1959. On the other hand, U.K. exports of plastics in the same period were valued at £22.9 million, a rise of 20%.

The Prime Minister's recent exhortations to British industry to export more, backed up by powerful arguments from Mr. Maudling, President of the Board of Trade, seem to have had little effect on the chemical industry. The bigger chemical concerns are already highly active and well organised in the export field and if any further effort is to be made it seems that it must come from the smaller chemical firms, particularly manufacturers of speciality products. Here, indeed, there are plenty of opportunities that have not yet been explored. But taking the chemical industry as a whole, exports have been steadily growing over a number of years and there is a limit to further expansion.

As far as the United States market is concerned, tariffs still create an obstacle to British chemical producers. It appears to some that the rather startling discrepancy, referred to above, between the increase in American exports to the U.K., and the slight decrease in U.K. exports to North America, could best be diminished by exhorting British industry to import

less chemicals from the U.S., rather than to export more. Much depends on the talks that begin in Geneva next month under the General Agreement on Tariffs and Trade (G.A.T.T.). Recent meetings of the U.S. Tariff Commissioners have indicated that the U.S. is likely to ask Europe for reduced tariffs on carbon-black synthetic rubbers, synthetic fibres and potash (CHEMICAL AGE, 6 August, p. 204). At the same time, American dyestuffs producers have been urging greater protection from imports, and this is bound

#### U.K. TRADE WITH OUTER SEVEN

	Imports		Exports	
	January-June	1959 1960	January-June	1959 1960
	£ million		£ million	
Austria ...	—	—	0.61	0.71
Denmark ...	0.28	0.50	2.64	2.91
Norway ...	1.86	2.26	2.59	2.85
Portugal ...	0.51	0.51	1.66	1.86
Sweden ...	1.22	1.57	4.24	5.40
Switzerland ...	2.95	3.76	1.68	2.09
	6.82	8.60 +26.6%	13.42	15.82 +17.8%

#### U.K. TRADE WITH COMMON MARKET

	Imports		Exports	
	January-June	1959 1960	January-June	1959 1960
	£ million		£ million	
Belgium ...	2.41	2.34	3.36	3.57
France ...	5.83	7.97	3.86	4.13
Germany, W. ...	11.28	14.34	4.96	6.19
Italy ...	1.87	3.61	4.69	5.73
Netherlands ...	4.65	6.87	5.84	7.92
	26.04	35.13 +34.5%	22.71	27.54 +21.2%

#### U.K. TRADE WITH NORTH AMERICA

	Imports		Exports	
	January-June	1959 1960	January-June	1959 1960
	£ million		£ million	
Canada ...	3.76	5.20	4.36	4.14
United States ...	14.64	24.56	5.65	5.66
	18.40	29.67 +61.6%	10.01	9.80 -2.1%

to have repercussions at the G.A.T.T. talks. In fact, the Americans can be expected to take a fairly tough line where the majority of chemical products are concerned. British representatives will have to overcome this to secure any further reduction in American tariffs.

Any hardening of America's attitude towards further chemical imports from the U.K. is likely to create a situation where British producers will have to seek further fields for exports. One market that is gaining increasing attention is the Soviet bloc, which the Americans themselves, as a whole, are reluctant to trade with. That the British industry is less fastidious is shown by the fact that during the first six months of 1960 Britain exported £3,299,804 worth of chemicals to the U.S.S.R., compared with only £937,230 in the first half of 1959—an increase of 252%. The economic necessity of developing further trade with the Soviet bloc has been pointed out by no less an authority than Mr. S. P. Chambers, chairman of I.C.I. The Americans would do well to bear this point in mind during the G.A.T.T. discussions.

### NAPHTHALENE SHORTAGE

**S**HORTAGE of naphthalene incurred during the prolonged U.S. steel strike last year has not yet been made good and the recent cut-backs made in steel output have given rise to a further setback. The import situation, too, has become critical. No more exports from West Ger-

many are stated as likely to be available until next year; a moderate quantity was recently offered at 18 cents/lb. f.o.b. as against the domestic price of 6 cents/lb. (78° crude naphthalene). No further supplies appear to be entering the U.S. from Russia and Poland.

Imports in the first quarter of this year have declined from 24.2 million lb. to 14.2 million lb. In 1959 as a whole, imports fell to 59 million lb. from 81.1 million lb. in 1958 and this year it is expected that U.S. imports will total between 50 and 55 million lb.

Present U.S. domestic capacity is running at about 610 million lb. a year when the steel industry is at full capacity. Production must satisfy about 500 million lb. of phthalic anhydride capacity, excluding *o*-xylene-based production (Oronite Chemical) and mixed xylene production (Amoco Chemical). If the U.S. phthalic industry is to operate at capacity this year, 625 million lb. of naphthalene will be needed; this could reach 680 million lb. by late 1961.

A number of factors lead U.S. petroleum producers to visualise a profit from the production of naphthalene from a refinery source. These are the decline in imports, the inability of U.S. coal tar producers to fill all needs, increases in the price of coal-tar naphthalene, the use of new and projected fluidised bed phthalic anhydride plants and the current large increases in overseas phthalic capacities which will absorb coal tar naphthalene available for export. By next year there will be more than 225 million lb. of petroleum naphthalene capacity available in the U.S.

A contract for a 75 million lb.-a-year plant has been awarded by Ashland Oil and Refining Co. Sun Oil Co. will put up a 100 million lb.-a-year plant at their Toledo, Ohio refinery, while recently Collier-Tidewater announced they would build a 50 million-lb.-a-year plant at Tidewater Oil Co.'s Delaware City refinery (CHEMICAL AGE, 6 August, p. 203).

With the growing realisation that coal tar naphthalene supplies would at most have been barely adequate, U.S. phthalic anhydride producers have been interested in fluid-bed installations which are particularly suited to the use of petroleum naphthalene. Existing fluidised bed plants are those of Sherwin-Williams Co. (7 million lb.) and Reichhold Chemicals (30 million lb.). Reichhold plan to set up a 60 million-lb.-a-year plant at Newark, while Witco Chemical have plans to erect a 30 million lb. plant, as do Allied Chemical. Reichhold will use a fluidised bed process, but Witco and Allied have yet to indicate their production routes. It is believed that Witco may use a similar process to that developed by Union Oil of California, which will be used by Collier-Tidewater.

The naphthalene shortage is not confined to the U.S., West Germany has the same problem. Exports from that country were increased to 39,405 tonnes in 1959 from 22,965 tonnes in 1958. At the same time, however, crude tar production in West Germany declined by 9.1% in 1959 to 1,730,000 tonnes, compared with 1,903,000 tonnes in 1958. Simultaneously production of phthalic anhydride rose by 21% to 55,900 tonnes.

Italy is also understood to be working on a 75% *o*-xylene-25% naphthalene basis for its phthalic output this year. In the U.S. *o*-xylene capacity is expected to increase to 290 million lb. a year by 1961. Present and planned capacity is already committed for export to Japan and Europe.

Questions very much in mind are whether the petroleum producers have acted too late and whether the U.S. will have an oversupply of naphthalene. Much additional capacity will be available by 1961 and the present steel situation does not indicate that more naphthalene will be forthcoming in the next year or so. The new plants, however, will doubtless need a proving period and an economic price will have to be found.

### Howards in Takeover Talks

**R**UMOURS that Fisons are negotiating for the takeover of Howards and Sons, the Ilford chemical manufacturers, have been strengthened by Howards' admission that takeover discussions have been going on with an unnamed concern. However, Fisons told *CHEMICAL AGE* that they were unable to make any comment on their rumoured connection with the discussions. It will be recalled that Fisons were recently involved in unsuccessful takeover discussions with British Drug Houses and with Crosbe and Blackwell.

Howards' shares, which have been climbing rapidly in price, have just gone up another 5s to 51s—more than double their price earlier this year. The talks are still at an early stage and Howards' chairman, Mr. T. W. Howard, has stated that the directors would only recommend an offer which was substantially in excess of the present market price. But there is no certainty, at present, that any offer will be forthcoming.

Howards was founded as a family business but the Howard family do not now have a controlling interest in the concern. The company has an issued capital of £475,000 in £1 shares and £450,000 in 5½% cumulative preference shares of £1. The chairman owns some 23,500 ordinary shares and about a third of the equity is held by other members of the Howard family.

'Alembic' (see p. 236) also makes a comment about the Fisons-Howards rumour in this issue.

### Wimpey Chemical Plant Division to Move

**T**HE growing number of staff of George Wimpey and Co. Ltd. concerned with the complete design and procurement of chemical plant and oil refineries will within the next week or two move into the newly acquired Flyover House, a new 12-storey office block near the Chiswick flyover. Initially about 550 staff will move into the building and will deal with the engineering of plant but not process design. Among the projects on which the staff are already engaged are the £A4 million polythene plant in Australia for Union Carbide, the chemical plant at Antwerp and the oil and chemical plant at Carrington in the U.K., for Shell, the Union Carbide Grangemouth plant and for British Petroleum in the Isle of Grain, as well as contracts in other countries including Nigeria and Kuwait.

### A.B.M.A.C. to Hold Insecticide and Fungicide Conference

An insecticide and fungicide conference, organised by the Association of British Manufacturers of Agricultural Chemicals, will be held at Brighton from 6 November to 10 November, 1961.

D

### Project News

## Simon-Carves and Monsanto Link to Provide Effluent Service

**L**INKING to form the Simon-Carves Monsanto Effluent Advisory Service, Simon-Carves Ltd. and Monsanto Chemicals Ltd. have pooled their long research, engineering and operating experience in the treatment and harmless disposal of industrial effluent. This new service, announced this week, is administered by Simon-Carves Ltd., from their headquarters at Cheadle Heath, Stockport, Ches. Head of administration will be Mr. G. F. G. Clough.

The service provides general advice on effluent problems, on-site and laboratory investigations on the treatment of specific effluents, recommendations and design data for effluent treatment processes and plants and continuing advice on the operation of commissioned treatment plants.

In addition to the advisory service, the full engineering and contracting organisation of Simon-Carves Ltd. is available for commissioning of complete effluent treatment plants. This service is available for use both at home and overseas, for industries as well as public authorities.

As designers and contractors in the coal carbonising, gas and chemical industries, Simon-Carves have had considerable experience on effluent treatment. In recent years they have carried out—and are still engaged on—intensive laboratory, pilot-plant and field-scale research and development on the treatment of effluents by biological methods. S.C. have eight commercial-scale biological effluent treatment plants in service, under construction and on order at colliery and steelworks coking plants in the U.K. and India. The company is also handling inquiries for the treatment of effluents from many other industrial processes.

For their part, Monsanto Chemicals have, in the course of developing successful techniques for the biological purification of their own complex effluents, carried out an intensive research programme for many years. Monsanto have successfully pioneered in the U.K. processes in which industrial organisations and public authorities throughout the world have long been interested. The research, design, engineering and operating data resulting from this work and from the continuing operation and development of the large effluent treatment installations at their works at Ruabon are now available to all interested parties through the Simon-Carves Monsanto Effluent Advisory Service.

### First Tonnox Unit for Blast Furnace Air Enrichment

● A CONTRACT to build and operate a 566 tons/day, 90% purity oxygen plant at Margam has been placed with British

Oxygen Gases by the Steel Company of Wales. Value of the contract is over £1 million. It is believed that the new plant will be the first tonnage oxygen plant to be built for blast furnace air enrichment in Western Europe. Scheduled to be in operation by January 1962, the new plant will give a final oxygen content of the enriched blast of 25%, leading to a substantial increase in iron production. The Steel Company of Wales already have two tonnage oxygen plants, both high-purity (about 99%) plants for metallurgical processes in open-hearth and Bessemer converters.

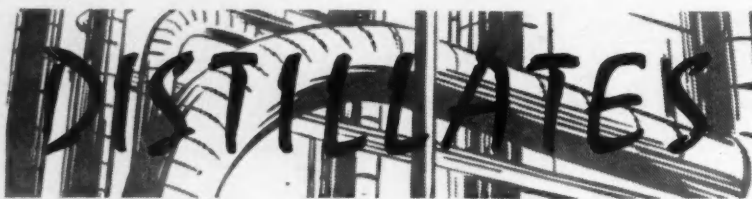
### Howards to Double Phthalic Capacity to 6,000 Tons

● EARLY this year, Howards of Ilford Ltd., started the production of phthalic anhydride and their plant, designed to produce up to 3,000 tons per year, is working "very satisfactorily". Anticipating a steady increase in demand for this product, Howards have decided to double capacity. They say that the contract has yet to be placed but the unit will be in most respects identical with the existing unit but will incorporate various improvements based on operational experience. It will start up in the autumn of 1961.

Howards' first phthalic anhydride plant was built by Chemical Engineering Wiltons Ltd., and uses the Ftalital process. A big proportion of the output of the first unit goes into the production of phthalic esters, also made by Howards, but the whole of the output of the new unit will be offered for sale.

### Sterilising Pharmaceuticals by Irradiation

**T**HE possibility of using radiation to sterilise pharmaceutical products was considered by the representatives of a number of organisations including 10 member firms of the Association of British Pharmaceutical Industry, the Atomic Energy Research Establishment, Harwell, the London School of Pharmacy and manufacturers of glass containers. Two aspects were studied: the radiation dose required to effect sterility, and the effect of radiation on substances of pharmaceutical importance. The working party, which was set up in 1956, has recently published its report. It was found that a dose of 2.5 by 10<sup>6</sup> rads had appeared to be adequate to achieve sterility but that it produces changes in pharmaceutical substances, which in many instances may render the preparation unacceptable for administration or presentation.



★ A UNIQUE combination of the skills of a chemical design and contracting company with those of a chemical producer are announced this week (see p. 235). Simon-Carves and Monsanto Chemicals, both of whom have accumulated through research and engineering unsurpassed know-how in the biological treatment of effluents have pooled their experience to form an Effluent Advisory Service.

Monsanto, who have pioneered biological purification processes in the U.K., have earned a world-wide reputation for their work in this field which is under the responsibility of Dr. I. S. Wilson. All the research, design, engineering and operational data from the development of the massive installations at Ruabon have thus been made freely available through the new service.

Simon-Carves, who also have much experience in the field, have a number of biological effluent treatment plants in service, under construction or on order both in the U.K. and abroad. This company will administer the new service under the direction of Mr. G. F. G. Clough, a senior technical man who has been on the S.-C. staff for a number of years.

★ THE Soviet Union does not seem to be as successful in the operation of some of its chemical plants as it has in the field of rocketry. According to Government statements made in Moscow, of 38 production centres for chemical plant and equipment, 27 did not reach their production targets last year. One centre attained only 2% and another under 1% of the planned level. During 1959, the Soviet chemical industry should have received plant and equipment worth 2,400 million roubles; in fact equipment worth only 1,900 roubles was delivered.

From the acknowledged state of the Soviet chemical plant industry, the U.S.S.R. will have to rely on the West for plant and equipment for some time, if the massive investment programme is to be fulfilled. That is why Soviet negotiating teams are still discussing with British chemical and contracting firms—as well as with those of other European countries—the supply of know-how and of several big complete plants. There is still much leeway to be made up if the Soviet chemical achievements are to match those of the West. Total investment over the current seven-year plan is set at between 100,000 million and 105,000 million roubles and by the end of 1965 it is claimed that some 140 new chemical works and 135 extended plants will be in production. It is obvious from the latest half-yearly

report of the Soviet Central Statistical Office that at present chemicals and fertilisers are very far behind the extremely ambitious seven-year plan. The claim that new facilities in 1959 for polythene and polypropylene were each five times greater than the capacities brought on stream in 1958 is meaningless. For the first half of 1960 sulphuric acid production totalled 2.7 million (2.5 million) tonnes, while output of mineral fertilisers over the same period is put at 6.8 million (6.3 million) tonnes.

★ IT HAS long been the cry of editors that if technical authors would learn to write concise, unambiguous and consistent copy their task would be much the simpler. A special publication issued by the Chemical Society called 'Handbook for Chemical Society Authors' may be a step in the desired direction, anyway for the editors of that particular society.

The handbook deals with most of the problems associated with chemical texts, particularly those of nomenclature. The International Union of Pure and Applied Chemistry rules are given for organic, inorganic and steroid chemistry with many clear examples, as is also the U.S.-U.K. agreement on carbohydrates and organophosphorus compounds.

Other chapters deal with the presentation of papers, physicochemical and spectroscopic symbols, crystallography and abbreviations of journal titles.

★ DISCUSSION of the possibilities of applying fuel cells to the propulsion of road vehicles will be given a fresh impetus by the news of a new type of low-temperature fuel cell developed by Shell Research at Thornton, Cheshire, which is said to be capable of producing from three to five times as much power as other cells of comparable size. Using hydrogen as fuel, it can produce 50 watts while operating at a temperature as low as 25°C. This not only takes a step nearer development of a fuel cell that meets the starting-from-cold requirements of vehicles, but also means that increased use can be made of plastics as materials of construction.

Shell Research are not saying much about the construction of their new fuel cell, but they give more than a hint that they have struck a new concept of electrode design that makes other designs look pretty silly. Meanwhile, the search goes on for a fuel that is cheaper and less 'difficult' than hydrogen, as well as for the answers to all the other problems that will have to be solved

before fuel cells can revolutionise motor transport.

★ THE recent Senate sub-committee hearings on the U.S. drug industry has led to proposals by the Food and Drug Administration with a view to tightening control over marketing, advertising and production of ethical drugs.

One of the proposed regulations would require virtually all containers of prescription drugs to give complete information for use of the drug, including information about any hazards, side effects or necessary precautions.

Another of the proposed regulations stipulates that when safety considerations require it, a new drug should not be marketed until the producer's representations on reliability of production methods, facilities and quality control have been confirmed by a factory inspection undertaken by F.D.A. U.S. drug manufacturers have been given until the end of September to submit comments on the new proposals.

★ A READER has drawn my attention to the story, reported in the *Journal* of the Society of British Paint Manufacturers, of the chemist who, tired of having his bottles of common chemicals 'pinched' by neighbours when they needed a little more in a hurry, worked out a plan to beat the pilferers. He labelled his bottles in Japanese.

While admiring the ingenuity of this particular chemist, I wonder how his colleagues determine the contents when he is away from the laboratory. Of course they could get their own back by labelling their bottles in, say, Chinese, Hindustani or Aramaic.

★ AT the moment of writing it's anybody's guess whether the rumour that Fisons are now bidding for Howards and Sons, Ilford, is the result of a leak or of some 'inspired guesswork' in the City. Certainly if there was anything in it Fisons might well be inclined to reticence after their recent unsuccessful bids for British Drug Houses and also for Crosbe and Blackwell.

Rumours being what they are, it was inevitable that the recent resignation of two Howards directors—Mr. J. M. C. Fox and Mr. D. V. E. Howard—should have been linked with the story of Fisons' takeover bid. But Mr. Thomas Howard, chairman of the venerable company that bears his family's name, is reported to have denied any such connection, the board changes being purely a matter of internal organisational strategy, with no ill-feeling involved. It does seem fairly certain that the strong family element in Howards will not let the concern go to any bidder without some pangs, and without an offer of such obvious benefits to shareholders that would outweigh any sentimental misgivings.

*Alembic*

# World Fertiliser Output Up 8% with Nitrogen as the Pacemaker

## F.A.O. Annual Review of Fertilisers

**T**HE world fertiliser industry has almost trebled its level of operations in the past two decades, states the Food and Agricultural Organisation in its new publication 'An Annual Review of World Production, Consumption and Trade of Fertilisers,' which was published by the Stationery Office on Monday, price 7s 6d. Main effect of the evident excess of production capacity has been to promote use wherever possible. The F.A.O. sees the greatest prospect for wider usage, particularly for nitrogenous fertilisers, in Asia and Far East, especially in China and India.

Combined world output of nitrogen, phosphoric acid and potash in 1958-59 reached an estimated 24.3 million tonnes, an increase of 8% on 1957-58. Total world consumption of fertilisers, excluding ground rock phosphate, is estimated at 22.98 million tonnes an increase of 7%. World consumption of ground rock phosphate was an estimated 532,000 tonnes (in terms of  $P_2O_5$ ), an increase of 5%.

While output of phosphate fertilisers (8.27 million tonnes) rose by 6.6% and that of potash fertilisers (7.28 million tonnes) rose by 7.4%, production of nitrogenous fertilisers (8.75 million tonnes) was higher by 10.5%. World consumption of nitrogen in 1958-59, at 8 million tonnes, was higher by 10.6%; consumption of phosphatic fertilisers was also estimated at 8 million tonnes, a rise, however, of only 3.9%; world consumption of potash fertilisers was estimated at 6.98 million tonnes, an increase of 6.4%.

A striking feature of the report is that output of nitrogen over the period 1953-54 to 1958-59 has increased much more rapidly than that of either phosphoric acid or potash; nitrogen having risen from 5.54 million tonnes to 8.75 million

provided by some countries did not distinguish between 'other nitrogenous fertilisers, including urea' and 'complex fertilisers.' Over the period 1953-54 to 1958-59 production of calcium nitrate (as a proportion of all nitrogenous fertilisers) declined from 7% to 5% and calcium cyanamide from 6% to 4%, ammonium sulphate from 32% to 28% and sodium nitrate from 6% to 4%. During the same period other materials rose significantly; 'solids,' including ammonium phosphate from 7% to 15% and 'solutions' from 16% to 18%.

So far as urea is concerned, production rose from 280,000 tons in 1956-57 to 480,000 in 1958-59, big increases being recorded in the U.S. and Japan. Announced capacities in thousands of tonnes of nitrogen for new urea projects are: Austria 6; Belgium 23; Brazil 55; Canada 36; Taiwan 85; West Germany 25; India 95; Indonesia 100; Japan 184; South Korea 85; Netherlands 31; Pakistan 59; Philippines 30; South Africa 51.

**Phosphate Fertilisers.** The striking feature of recent years has been the rise in the percentages of concentrated superphosphate, basic slag and 'other products' at the expense of single super-

phosphate, which in 1957-58 accounted for 54% of total world supplies, compared with 66% in 1953-54. Estimates for 1958-59 suggest a further decrease in the percentage contribution of this fertiliser, the difference being made good by an expanded output of 'other products,' of which complex fertilisers form a larger part.

Concentrated superphosphates now provide almost 14% of total phosphatic fertilisers compared with about 9% in

**TABLE 3**  
Urea for Fertiliser Use  
(tonnes of N)

	1957-58	1958-59
Austria ...	1,600	4,200
France ...	3,850	8,484
W. Germany ...	48,000	49,000
Italy ...	31,006	40,000
Norway ...	14,000	18,900
Poland ...	—	11
Switzerland ...	400	500
U.S.* ...	76,000	104,000
Taiwan ...	—	1,035
Japan ...	173,135	250,240
Total ...	350,000	480,000

\* Not including liquid urea for fertiliser usage.

1953-54. The bulk was made in the U.S. Basic slag, which provides for 16% of the world's phosphate fertilisers is only produced in large quantities in a few European countries (France, West Germany, Belgium, Luxembourg and the U.K.).

**Potash Fertilisers.** Data were not available for the quantities of different types of potash fertilisers produced by East Germany. Total output in this country is about 24% of world production of  $K_2O$ . Figures for the three large producing countries, the U.S., France and West Germany are given in Table 5.

**Consumption.** Over the period 1953-54 to 1958-59 the expected increase in world consumption of all fertilisers is nitrogen, 47%; phosphoric acid 21%; potash 28%; the total for all fertilisers being 31%.

Ever increasing interest is being shown in the use of urea, world con-

**TABLE 1**  
World Production and Consumption  
of N,  $P_2O_5$  and  $K_2O$

	Production '000 Tonnes		% Increase	
	1957-58	1958-59	'57-'58	'58-'59
N ...	7,920	8,750	8.8	10.5
$P_2O_5$ ...	7,760	8,270	2.9	6.6
$K_2O$ ...	6,780	7,280	—0.4	7.4
Total ...	22,460	24,300	3.8	8.2
	Consumption '000 Tonnes		% Increase	
	1957-58	1958-59	'57-'58	'58-'59
N ...	7,230	8,000	7.1	10.6
$P_2O_5$ ...	7,700	8,000	2.8	3.9
$K_2O$ ...	6,560	6,980	2.5	6.4
Total ...	21,490	23,980	4.1	6.9

tonnes; phosphoric acid from 6.57 million tonnes to 8.27 million and potash from 5.6 million to 7.28 million.

Ammonium sulphate now accounts for 28% of the world total and is still produced in greater quantities than any other nitrogenous fertiliser, but it is, however, now strongly challenged by ammonium nitrate, which accounts for 25% of nitrogenous fertilisers. Together the two materials account for 54% of the world total. Output of sodium nitrate, calcium nitrate and calcium cyanamide has shown a marked decline. Single superphosphate accounts for 54% of phosphate fertiliser output.

**Nitrogen.** Data shown in Table 2 are only approximate. No details were received from East Germany while data

**TABLE 2**  
Types of Nitrogenous Fertilisers Produced  
('000 Tonnes)

		Europe*	N. & C. America	S. America	Asia	Africa	Oceania
Ammonium sulphate ...	1957-58	985.7	345.1	—	644.9	7.3	25.3
	1958-59	1,109.6	344.1	—	689.1	10.3	25.1
Ammonium nitrate ...	1957-58	1,495.3	333.0	—	10.6	5.0	—
	1958-59	1,519.6	359.0	—	16.3	5.9	—
Sodium nitrate ...	1957-58	5.0	†	240.0	—	—	—
	1958-59	5.5	†	240.0	—	—	—
Calcium nitrate ...	1957-58	325.9	†	—	—	26.6	—
	1958-59	332.0	†	—	—	32.2	—
Calcium cyanamide ...	1957-58	137.7	†	—	111.3	—	—
	1958-59	156.3	†	—	95.2	—	—
Other N fertilisers, including urea	1957-58	143.2	†	18.5	210.1	—	3.0
	1958-59	173.3	†	14.8	286.9	—	3.0
Complex fertilisers ...	1957-58	382.8	1,476.0	16.0	33.1	1.1	—
	1958-59	450.7	1,737.0	16.0	45.5	1.0	—
Totals ...	1957-58	3,475.6	2,154.1	274.5	1,009.9	40.0	28.3
	1958-59	3,747.0	2,440.1	270.8	1,133.0	49.4	28.1

\* Not including Bulgaria & Poland

† Included in 'complex fertilisers'

**TABLE 4**  
**Types of Phosphate Fertilisers Produced**  
(<sup>000</sup> tonnes of P<sub>2</sub>O<sub>5</sub>)

		Europe*	N. & C. America	S. America	Asia	Africa	Oceania
Single superphosphate	1957-58 1958-59	1,488.9 1,548.9	1,211.2 1,277.2	18.0 18.0	286.6 312.8	181.0 198.4	669.1 642.5
Concentrated superphosphate	1957-58 1958-59	162.5 160.4	766.0 816.0	— —	1.1 3.8	47.8 59.4	— —
Basic slag	1957-58 1958-59	1,125.5 1,140.3	14.0 14.0	— —	2.3 —	1.4 1.5	— —
Other phosphate fertilisers	1957-58 1958-59	222.6 251.9	† †	19.6† 16.6†	73.0 64.5	6.9 7.4	— —
Complex fertilisers	1957-58 1958-59	446.6 520.8	346.0 454.0	— —	29.7 37.6	— —	5.0 5.0
Total	1957-58 1958-59	3,446.2 3,622.3	2,337.2 2,561.2	37.6 34.6	392.7 418.7	237.1 266.7	674.1 647.5

\* Not including Poland

† Included in 'complex fertilisers'

‡ Guano &amp; other organics

sumption having risen from 240,000 tons in 1956-57 to an estimated 360,000 tons in 1958-59. Japan (163,000 tons last year) and the U.S. (77,000 tons) are by far the largest users.

Consumption of potash has increased steadily in Europe since 1953-54, but the rates of increase have been greater in most other continents, the most rapid occurring in South America where consumption has more than doubled. Europe still uses three-fifths of the world's potash supplies.

**Europe.** Production of all fertilisers in Europe in 1958-59 reached an estimated 13,745,000 tonnes, 6% up on the previous year. Output of phosphate fer-

tilisers, Belgium, 76,603 tonnes; East Germany 64,012 tonnes. U.K. production, at an estimated 348,000 tonnes in 1958-59, was up by 14,800 tonnes.

Potash production over the same period increased by 496,800 tonnes in France, by 226,000 tonnes in East Germany and by 247,700 tonnes and 65,400 tonnes in West Germany and Spain respectively.

**America.** Output of all fertilisers in North and Central America in 1958-59 reached an estimated 7,540,000 tonnes (5.6 million tonnes in 1953-54). Output of phosphate fertilisers (2,750,000 tonnes in 1958-59) increased over the six-year period by 446,000 tonnes, that of potash (2,112,000 tonnes) by 512,000 tonnes and that of nitrogen (2,680,000 tonnes) by 979,000 tonnes. Consumption of all fertilisers, except ground rock phosphate, in 1958-59 was estimated at 7,014,000 tonnes, a 7% rise on the previous year.

The use of anhydrous and aqueous ammonia for direct application in the U.S. is growing fast. Consumption of urea is also expanding rapidly both as a fertiliser and as an animal feed. There has been a decline in the amount of ammonium sulphate used. Synthetic ammonia capacity in the U.S. in 1957-58 was estimated at some 4 million tonnes; during the same year capacity for potash fertilisers in the U.S. was estimated at 2.5 million tonnes of K<sub>2</sub>O.

**Asia.** Output of all fertilisers in 1958-59, an estimated 1,642,000 tonnes, was up by 11%. Output of phosphate fertilisers (426,000 tonnes) was higher by 8%; that of potash fertilisers (73,000 tonnes) was up by 14% and that of nitrogenous fertilisers (1,143,000 tonnes) rose by 12%. Consumption of all types, except ground rock phosphate, reached an estimated 2,506,000 tonnes in 1958-59, 18% up on the previous year.

Asia is by far the largest net importer of all fertilisers, imports during 1958-59 being estimated at: nitrogen, 208,000 tonnes; phosphoric acid, 165,000 tonnes and potash, 475,000 tonnes. Production since 1953-54 of nitrogen has shown a rise of 68%, compared with an increase of 37% in phosphoric acid. Most of the increase in nitrogen production took place in Japan, whose estimated production in 1958-59 was 87% of the total for Asia. Production of phosphate fertilisers in India, the second largest producer in Asia, is up almost 180%

over the 1953-54 figure of 13,672 tonnes.

New plants due in production in India in 1959-60 will give an installed capacity for nitrogen of 155,000 tonnes (up 82%), and an estimated production of 115,000 tonnes (up 43%). Installed capacity for phosphoric acid in 1959-60 will total 50,000 tonnes, no change, but production is estimated at 50,000 tonnes, against an actual 1958-59 figure of 27,000 tonnes.

Plans for new ammonia synthesis facilities in Japan include Nippon Gas Chemical Co. (expansion) 200 tons/day for urea; Beppu Chemical Co., 150 tons/day for ammonium sulphate; Asahi Chemical Industry Co., 50 tons/day using Texaco process; Befu Chemical Co., 100 tons/day using Texaco process; Nitto Chemical Industry Co., 125 tons/day, using Texaco process.

## Strike of 120 Continues at Hardman and Holden

SOME 120 engineering craftsmen employed at the Miles Platting, Manchester, chemical works of Hardman and Holden Ltd., have been on unofficial strike since 3 August. As we go to press, pickets are out to back the strike. A spokesman for the company states that there has been no serious effect on production so far.

The main dispute is over rates of pay, particularly for overtime, but it has also been reported that discontentment with maintenance schedules and with the employment of outside contractors in the works is also involved. The strike came, according to a union official, after the firm had been given two warnings about the employment of outside contractors. Unions affected include the E.T.U., A.E.U. and C.W.U.

## Pay Increases for I.C.I. Production Workers

I.C.I.'s offer of increases in basic rates of pay for about 50,000 of its general production workers have now been accepted by the unions concerned—including the Transport and General Workers Union and the General and Municipal Workers Union. As reported in CHEMICAL AGE, 30 July, p. 159, the union representatives felt unable to accept the original offer, which involved substantially the same terms, and the matter was referred back to the company. At that time, the recent unofficial strike of about 2,000 I.C.I. craftsmen was in progress.

For a standard working week of 42 hours, men workers will get an increase of 7s 10½d, and women 7s, under the new agreement.

In addition, craft workers of I.C.I.'s mid-Cheshire works have been offered a 10% interim rise, and this has been accepted subject to the men accepting incentive bonus schemes based on work measurement. For craftsmen this represents an increase of about 22s for a 42-hour week, as compared with the 9s 7½d or more a week granted to the craftsmen, and accepted by the craftsmen's unions, in mid-July. It was dissatisfaction with this earlier increase which led to the unofficial strike.

**TABLE 5**  
**Types of Potash Produced in**  
(<sup>000</sup> Tonnes)

		France	West Germany	U.S.
Pot. sulphate	'57-'58 '58-'59	148 176	109 133	106* 111*
Muriate:				
Over 45%	'57-'58 '58-'59	1,203 1,024	774 868	1,640 1,983
K <sub>2</sub> O				
20-45% K <sub>2</sub> O	'57-'58 '58-'59	238 222	604 565	— —
Crude potash salts, up to 20% K <sub>2</sub> O	'57-'58 '58-'59	27 23	62 56	— —
Other potash fertilisers	'57-'58 '58-'59	2 4	75 76	18† 18†
Complex fertilisers	'57-'58 '58-'59	— —	— —	— —
Total	'57-'58 '58-'59	1,438 1,449	1,624 1,698	1,764 2,112

\* Inc. sulphate of potash-magnesia

† Inc. small quantity of crude potash salts and complex fertilisers

tilisers (4,105,000 tonnes) was up 6%; that of potash fertilisers (5,077,000 tonnes), up 3%; and nitrogen (4,563,000 tonnes) up 10%. Consumption of all fertilisers, excluding ground phosphate rock, was 11,670,000 tonnes, a 6% rise on 1957-58.

The largest increase in production of nitrogen since 1953-54 was in West Germany, rising 404,700 tonnes to 1,050,000 tonnes. Other countries with increases of 50,000 tonnes or more were: France, rising 271,000 tonnes to 556,700 tonnes; Italy, rising 283,273 tonnes to 545,750 tonnes; Poland up by 155,000 tonnes; Netherlands up 133,700 tonnes to 393,700; and Belgium up 84,355 tonnes to 295,077 tonnes. U.K. production in 1958-59, at 350,000 tonnes, was higher than in 1953-54 by 34,955 tonnes.

The largest increase in production of phosphoric acid for the same period was also in West Germany (213,900 tonnes). Other countries with increases of 50,000 tonnes or more were: France, 183,635

# New Chemical Uses for Castor Oil Should Expand Demand

## T.P.I.'s First Annual Report

**FIRST** report of the Tropical Products Institute since it became one of the research stations of the Department of Scientific and Industrial Research in April 1959 has just been published ('Report of the Tropical Products Institute 1959', H.M.S.O., 2s 6d). Main objective of the Institute is to improve the economic viability of under-developed territories of the tropics, primarily those in the Commonwealth. Research is carried out on new uses for tropical plant and animal products, on which new industries might be based. During the next five years, research priority will continue to be given to immediate industrial problems and projects promising application within a fairly short period.

The following is a summary of some of the Institute's recent advisory and research activities.

**U.K. as Alcohol Market.** The Institute was asked to consider the possibilities of marketing in the U.K. industrial alcohol produced in Mauritius from molasses. In view of the dominating position held by synthetic alcohol from petroleum, it was not thought possible to recommend investment in new plant for alcohol production by fermentation, particularly since at present a big proportion of Mauritius molasses production is used as a fertiliser, part of which, at least, would have to be replaced by imports. Other unfavourable factors include the long distances from the markets, lack of a regular tanker service and competition from countries which are more favourably placed economically.

### Castor Oil Survey

**Castor Oil.** A survey was made of the world markets for castor seed and oil and of trends in the use of oil. Main obstacle to establishing a new source of castor oil in the U.K. market is the conservative attitude of users to sources of supply. Oil from new sources, therefore, would need to be very competitive in price and at least equal in quality to that from India, the main supplier to U.K. New industrial applications for castor oil, particularly as a raw material for chemical manufacture, seem likely to expand the demand for the oil. In the U.S.—largest single market for the oil—consumption is expected to increase considerably in the next 10 years. However, domestic production of seed is being encouraged in the U.S.

**Detergents from Sugar?** Potential world production of sugar is far in excess of requirements for food; this has seriously affected countries whose economy is mainly based on sugar production. A promising investigation is being carried out on the production of materials, based on sugar and naturally occurring fatty acids, which have surface-

active properties. If materials could be made which could compete with existing commercial detergents they would find a wide field of applications as they would be non-toxic and also readily decomposed during the normal sewage disposal processes. A number of papers and patents have already appeared which describe the preparation of sucrose esters such as the oleates, palmitates, stearates, etc., by interacting the sucrose with esters such as methyl stearate, in homogeneous solution in the presence of an alkaline catalyst.

**Sesquiterpene Hydrocarbon.** Work has continued on the structure of the new sesquiterpene hydrocarbon, strobilanthene, which was isolated from the essential oil of *Strobilanthes linifolia* from

Northern Rhodesia. The hydrocarbon has a cadalene type of structure and yields cadinene dihydrochloride with hydrochloric acid. Analytical studies support the view that strobilanthene contains a cyclopropane ring with a conjugated exocyclic double bond. Attempts at ozonolysis and other methods of degradation to yield identifiable products have proved surprisingly difficult, but some progress along these lines is now being made.

**Solar Energy.** An experimental flat plate collector has been set up to study the effect of plate design, plate surface, type of cover and spacing, turbulators, throughput, rates, etc., and to afford experience of solar water heating generally. The collector was designed to hold three separate collector plates measuring 6 ft. by 2 ft., so that a direct comparison could be made between different collector plate designs. Water circulation is by means of a pump operated on a closed system and a 12-line continuous recorder has been installed to study temperatures at various positions in the collector.

An examination of air heating is planned along similar lines as a preliminary to investigating artificial crop drying by solar means.

## Polymer Symposium Arranged for B.A. Annual Meeting at Cardiff

**FOR** the third time in its history the British Association for the Advancement of Science visits Cardiff for the annual meeting, to be held from 31 August to 7 September. The programme will include lectures, discussions, films and visits as well as a number of social functions.

The emphasis in the chemistry section programme is on polymer chemistry with lectures on polythene, epoxide resins, modern aspects of polymer structure and the mechanism of polymerisation reactions. One section, however, is devoted to silicones.

One of the two evening discourses, to be held on 5 September at 8 p.m. in the City Hall, Cardiff, will be on 'Microbiological methods in the development of drugs.' It will be given by Prof. E. B. Chain, F.R.S., head of the International Centre for Chemical Microbiology, Istituto Superiore di Sanita, Rome.

### Chemistry Section

The list of chemistry lectures is as follows: the chemistry section presidential address given by Dr. James Taylor, M.B.E., 'Chemistry is not enough' or 'The increasing scope of the scientist's work in chemical industry'; 'Technical development of a new product—polythene,' by Dr. E. Hunter; 'Commercial development of a new product—epoxide resins,' by P. J. Marsh; 'Some new stereoregular polymers,' by P. R. Thomas; 'The graft polymerisation of styrene on to pre-irradiated polyethylene,' by Dr. T. T. Jones; 'Modern aspects of polymer structure and its relation to property,' by J. L. B. Benton; 'The mechanism of polymerisation reac-

tions catalysed by ionic catalysts,' by Prof. A. G. Evans; 'The industrial applications of silicones,' by Dr. J. Bell; 'The formation reactions of high-molecular polyorganosiloxanes,' by Prof. K. A. Andrianov; and 'The commercial production of silicones,' by Dr. R. A. Gregory.

A number of excursions to places of interest have been arranged, including I.C.I. Billingham Division works at Dowlais, Glam; Monsanto at Newport, and Midland Silicones at Barry.

British Association members will visit the laboratories of British Geon Ltd., British Resin Products Ltd. and Distrene Ltd., Barry, Glamorgan, on 6 September. B.A. members will see a varied programme of research, development and technical service work being carried out in the laboratories of the three companies, all of which are members of Distillers Plastics Group.

Chemistry section dinner will be held on Friday, 2 September, at St. Mellons Country Club, St. Mellons, Glam, at 7 p.m. A tea for young chemists will be held in the Chemistry Department, Cardiff University, at 4 p.m. on 31 August.

Of general interest, and one day of the chemistry section programme is devoted to it, is the symposium to be held on 'World food and population.' Although the last few decades have seen immense advances in agriculture, biological and technological sciences, there has been at the same time an unparalleled upsurge in population. The question of whether food production can keep up with increasing demand will be discussed in a series of lectures dealing with various aspects of the problem.

## Evaluation of New Products Plays Big Part in Natural Rubber Development Programme

NATURAL rubber produced in 1959 found a ready market and the price remained at a remunerative level. This is stated by the Natural Rubber Development Board, renamed the Natural Rubber Bureau (as from 19 July last), in their 1959 annual report. The report adds that this and the fact that synthetic facilities, particularly in the U.S., are reported to have operated below their maximum capacity confirms opinions expressed in the past that natural and synthetic polymers are complementary and moreover the excellent properties of the natural product are essential to rubber manufacture.

Evaluation of new products developed in Malaya has played a prominent part in the 1959 programme of the Rubber Technical Developments Ltd., jointly owned by the Natural Rubber Development Board and the British Rubber Producers' Research Association, whose annual report is also published. The most important of these products have been superior processing (SP) rubbers and low ammonia latices.

### Properties Compared

Detailed comparisons of the processing properties of SPRSS and standard RSS were carried out, and no processing differences were noted, but as far as extruding behaviour of a rubber is concerned, it was found possible to use higher speeds at much lower temperatures with SP stocks than could be used with the standard stocks without loss of surface smoothness. Under conditions therefore where temperature must be kept low to avoid scorching the compound, SP stocks can give a marked increase in throughput. Where firmness of uncured stock is more important than throughput, it is possible to process SP stocks under the same extruding conditions but at a higher Mooney viscosity level, thereby easing handling difficulties.

Production of a non-woven fabric without the defects of delamination normally associated with this type of material has been reported. This has been achieved by the use of heat sensitive latex compounds, which has also made it possible to prepare consolidated heavyweight fabrics of high rubber content and extreme flexibility, which may have wide uses in the shoe and allied trades.

By the depolymerisation of rubber preloaded with certain fillers, low viscosity compounds can be prepared which yield considerably stronger vulcanisates than those obtained by the addition of a filler to an already depolymerised rubber. Using soft carbon black or aluminium silicate, it is possible to obtain, after depolymerisation for 4 hours at 120°C, pastes which yield products with tensile strengths approaching 200 kg/cm<sup>2</sup>.

Possible applications of these new paste compounds are currently being investigated.

World production of natural rubber in 1959 was 2,065,000 tons (1,957,500).

The most significant contribution of rubber to road building will be its low cost, although it has much to offer to each type of highway. Good progress has been made in the use of latex as an additive, and in the U.S. research continues on the methods of blending latex into bitumen.

### First Magnox-Stainless Steel Joining Developed

FOR the first time a gas-welded sealing joint between magnox (a magnesium alloy containing small amounts of aluminium, beryllium, iron and silicon) and stainless steel is being successfully made by the U.K. Atomic Energy Authority. The new process involves the use of Tinfux and was developed by the sales technical service department of British Oxygen Gases Ltd., at Cricklewood, in co-operation with the A.E.A. It follows an earlier technique adopted for the welding of dissimilar metals.

The present application is carried out on special bolts used to secure canisters in position for deadweight load and pressure tests. Bolt stems of stainless steel are fitted with magnox bushes under the heads. A 'welded' seal is made between the bushes and the bolt heads. Recesses in the bushes form joints with the tops of the canisters and act as vacuum-tight seals during testings.

The magnox canisters are designed to hold radioactive material, and to operate within the atomic pile.

### Price Reduction for Maydown-made Neoprene

FROM 2 August the price of neoprene type W has been reduced by the Du Pont Co. (United Kingdom) Ltd., 76 Jermyn Street, London S.W.1, to 3s 2½d per lb. delivered, from 3s 6½d. The reduction applies only to neoprene type W produced at the recently opened Maydown Works, Northern Ireland, where production has led to a lowering of total costs. Prices of all types of neoprene produced by Du Pont in the U.S. remain unchanged.

Tests are said to have shown that Maydown neoprene can be used interchangeably with neoprene type W of U.S. manufacture in all processes and products.

Other neoprene dry types and neoprene latex types will be produced at Maydown and prices of these will be reduced as soon as they become available for delivery.

The Board has continued to support the Plant Linings Group of the Federation of British Rubber and Allied Manufacturers to promote the use of rubber in chemical engineering plant.

In the U.K., latex foam continues to hold its place as an upholstery material but is meeting increasing competition from the polyurethane foams. The advent of the new Pincore foam, however, has succeeded in stimulating further interest in latex foam, particularly in the aircraft industry where weight is a criterion. Rubber is being increasingly used in footwear, which can partially be ascribed to the development of the hardwearing resin rubbers utilising either natural or synthetic rubber. Natural rubber is also preferred for the process by which soles are directly vulcanised to the uppers.

### B.o.T. Take Cobalt Compounds, Diphenylamine, from Embargo List—Other Goods Added

CHANGES in the control of merchanting transactions, announced by the Board of Trade, are to come into force on 22 August. These changes include the removal of control from certain types of cobalt compounds and from diphenylamine, while control will be imposed on a range of goods including specified thermal conducting cells, ion vacuum pumps, specified containers for liquid fluorine, and certain types of metal pipe and tubing covered with p.t.f.e. or p.c.t.f.e.

The description of goods to which control applies has been amended in the case of certain electronic and precision instruments and apparatus, hydrogen peroxide, boron compounds, hydrazine and hydrazine hydrate, cobalt, nickel alloys, germanium and silicon.

The order making these changes is the Strategic Goods (Control) (Amendment) Order 1960 (H.M.S.O., 6d). It reflects changes in the strategic goods embargo list, the majority of which were shown in the Board of Trade's *Journal* on 5 February.

### U.S. Meeting on Chemical Markets in Europe

CHEMICAL markets in Germany, England, France and Italy, will be dealt with at a meeting to be held under the title 'The European chemical industry' by the Chemical Market Research Association of the U.S. on 22 and 23 September at Portsmouth, N.H.

Speakers will include John Townsend, of I.C.I., H. G. Sinkel, Chemische Werke Hüls, Rene Peillot, St. Gobain and G. Ballabio, of the Hydrocarbon and Derivatives Division of Montecatini.

### Ion-exchange Water in Polarography

An informal discussion meeting of the Polarographic Society will be held at the Duke of York, 8 Dering Street, London W.1, at 7 p.m. on 7 September, when a representative of the Permutit Co. Ltd. will open discussion on 'The use of ion-exchange water in polarography.'

## Overseas News

### PROGRESS IN FIVE-YEAR PLAN TO RAISE INDIAN FERTILISER OUTPUT

**PROGRESS** in the building of new fertiliser plants in India, as part of the 1961-65 plan to raise Indian fertiliser output to 1 million tons, is reported from various sources. The total estimated cost as far as nationalised fertiliser producers are concerned is given as about £145 million.

In addition to the superphosphate/sulphuric acid plant being built by Adarsh Chemicals and Fertilisers Ltd., near Bombay (C.A., 23 July, p. 129), another recently formed company, Premier Fertilisers Ltd., are to build a fertiliser plant at Cuddalore (Madras). Projected output has not yet been disclosed. Another project is that of Fertilisers and Chemicals Travancore Ltd., who are planning expansion of their nitro-fertilisers capacity from 20,000 to 60,000 tonnes/year.

The proposed fertiliser factory near Kothagudem is being designed to produce 80,000 tons of nitrogen a year, according to a statement by the Andhra Chief Minister to the State Legislative Council. Of the total output, 45,000 tons will be converted into urea (92,000 tons/year) and the balance of 35,000 tons into nitrophosphate (183,000 tons/year).

The United Nations' technical assistance programme will finance a survey of the fertiliser industry in India this year. It will continue into 1961 and will report on the types of plants required for producing the different kinds of fertiliser involved in the proposals for the third five-year plan period.

#### B.B.U. of Austria Has State Loan for Superphosphate Plant

The B.B.U. concern of Austria plans to take up production of 30,000 tonnes of superphosphate annually based on sulphuric acid from the lead and zinc works at Gailitz. Austrian demand for superphosphate fertilisers at present stands at 220,000 annual tonnes and it is covered by 150,000 tonnes from the Stickstoffwerke at Linz and imports. The B.B.U. scheme, to be carried out in co-operation with Stickstoffwerke, will be backed by a Government loan of Sch.13,000,000.

#### Egypt Takes Over Drug Import Houses

Following the nationalisation of the pharmaceutical trade in the United Arab Republic, all Egyptian agencies of foreign firms supplying pharmaceutical and medicinal products to the country as well as all major druggist concerns have been taken over. The High Authority for Pharmaceutical Products is now the sole importer of these goods into Egypt. As a result of the cutting out of private profits, the Government says it will be possible to reduce the prices of all medicinal products by 25% as from 1

September. Last year Egypt imported pharmaceutical and drug products worth £E5,800,000, main suppliers being Switzerland, Hungary and the U.S.

#### East German Equipment for Indian Oxygen Plant

The National Oxygen Corporation Ltd. is a new company being set up in India to undertake the building near Bombay of a plant for the production of oxygen and acetylene. Construction, which will cost some £3.75 million, will be by the Indian firm of Ruia-Chinai and Co. Private Ltd. Equipment will be bought from East Germany and paid for in rupees.

#### Union Carbide Re-organise in Canada

Union Carbide Canada Ltd. have re-organised their operations and the Bakelite Co. has become Bakelite Division; Carbide Chemicals Co., the Chemicals and Plastics Division; Electro Metallurgical Co. and Haynes Alloys Co. have become the Metals and Carbon Division; Linde Co., is now Linde Gases Division; National Carbon Co., is Consumer Products Division; and Visking Co. is Visking Division.

#### Production of Hydrochloric Acid in Italy

Production of hydrochloric acid in Italy in 1959 was 117,414 tons, 60.5% of which was produced by synthesis and the rest by other methods. The processes for which hydrochloric acid is used in Italy include: the manufacture of chlorides, paints, dyes, acid fats, tartaric and citric acids, and the textile and synthetic perfumery industries. Italian trade in hydrochloric acid is negligible (222 tons imported and 991 tons exported in 1959) and consequently home production matches consumption. The cost of synthetic acid varies between 13.5 and 25 lire per kg. depending upon quantity purchased and district, and non-synthetic acid sells at between 10 and 13 lire per kg.

#### Pennsalt Complete \$6 M. Chlorine-Caustic Expansion

A \$6 million expansion of their chlorine-caustic plant at Wyandotte, Mich., has been completed by Pennsalt Chemicals, increasing output of chlorine, caustic soda and hydrogen. Some 5,000 diaphragm-type electrolytic cells have been replaced with 200 30,000-amp. cells.

#### U.S. Surfactants Output up 10% in 1959

Production of surface active agents in the U.S. last year totalled 1,490 million lb., 10.2% more than in 1958. Sales last

year totalled 1,360 million lb., valued at \$268 million (1,200 million lb., valued at \$235 million). Output of anionic materials in 1959 was 1,060 million lb., representing 71% of total U.S. surfactant production. Output of cyclic surface active agents rose 10.6% to 936 million lb., while output of acyclic products was 9.6% higher at 558 million lb.

#### German Recommendations for Pakistani Petrochemicals

A West German study commission has advised the Pakistan Government to erect the following plants for the foundation of a national petrochemical industry: Fischer-Tropsch; acetylene and acrylonitrile (5 tonnes/day capacity); polyvinyl chloride; methylmethacrylate; polyester fibres; rayon (5 tonnes/day capacity); nylon 6.6; high-pressure polythene; and fatty alcohol on a coconut oil basis.

#### Trial Production of New Synthetic Fibre in Japan

Toyo Koatsu Industries Ltd., the Japanese chemical producer, have begun trial production of U-Rylon, a new chemical fibre, made by the polycondensation of mono-methylamine and urea. In the course of the year daily output is to be raised to 15-20 tonnes.

#### Koppers New Freezing Process for Desalination

Freezing process of Koppers Inc. for desalination involves separating from crystals of hydrocarbon hydrate the crystals from the saline liquor and breaking up the hydrate with slight heating. (U.S. patent 2,904,511.) Propane has been used in the technique, but other hydrocarbons are also being studied. The process should use less energy than other freezing methods, since the crystals form at temperatures higher than the freezing point of water.

#### Richardson Carbon Plan 50 M. Lb./year Furnace Black Plant

A 50 million-lb.-a-year furnace black plant is planned by S. Richardson Carbon Co. at Big Spring, Tex., near the refinery of Cosden Petroleum. When the plant is in production by the middle of next year, the company will produce HAF and ISAF blacks under licence from United Carbon Co. Richardson Carbon operate the world's largest channel black plant at Odessa, Tex., with a capacity of 63.5 million lb. a year.

#### Parke Davis to Build Factory in Belgium

Parke Davis and Co. of the U.S. are to erect a branch factory and sales centre at Bornem, to the north of Brussels. Some \$970,000 are to be invested in the undertaking, which is intended to serve the Benelux area.

#### Shell to Raise Styrene Capacity By 75 Million lb.

Styrene monomer capacity of Shell Chemical at their Torrance, Calif. plant is to be raised from 135 million lb. to 210 million lb. a year. The expansion

should be completed early next year and will by the end of 1961 raise the total U.S. styrene capacity to 2,000 million lb. a year, when other expansion projects (by Dow, Monsanto, Sinclair-Koppers, Foster Grant, Odessa Styrene and Cosden Petroleum) are completed (see also *CHEMICAL AGE*, 7 May, p. 758).

### Dow to Produce Canada's First Polypropylene

Polypropylene resin is to be produced by Dow Chemical of Canada Ltd. at their Sarnia, Ont., facilities. Construction of Canada's first polypropylene plant is expected to start late next year, with the plant operational towards the end of 1962. Capacity is estimated at 12 million lb. a year. Dow Chemical have already announced plans to produce propylene oxide and glycols at Sarnia.

### Mexico-U.S. Gas Pipeline

A gas pipeline from Reynosa in Tamaulipas to Mexicali in Baja, California, is planned by Petroleos Mexicanos (Pemex) and the Tennessee Gas Company. The pipeline, spanning more than 1,200 miles of Mexican territory and using 450,000 tons of Mexican steel will be one of the longest gas-ducts in the world and will remain entirely the property of Mexico. The project is only in the preliminary stages; there are certain legal problems to be overcome and confirmation of the project is still awaited from the engineers. If the pipeline is built it will be operated by Pemex.

### Czech Chemical Plants for Indonesia

During the visit of the Indonesian Minister Djuanda to Prague, an agreement dealing with the economic co-operation of the two countries was signed under which Czechoslovakia has granted Indonesia a long-term loan of £12 million, most of which will be used for the building of 12 chemical plants in Indonesia. The Czech authorities have offered to undertake all planning work for the plants and supply all plant and equipment needed.

### U.S. to Speed Coal Research

The U.S. Department of the Interior is to proceed as quickly as possible with the establishment of an Office of Coal Research to contract for research aimed at the increasing utilisation and output of coal. The recently approved Coal Research Act provides that the Office of Coal Research will be aided by advisory groups to assist in the screening and selection of coal research projects.

### Higher-purity Vanadium by Fused-Salt Electrorefining

Purity and workability of vanadium metal have been found to improve markedly when electrorefined by a technique developed by the U.S. Bureau of Mines. The method, a fused-salt process, features a surrounding atmosphere of helium. By excluding the air and

minimising the two principal contaminants of vanadium, oxygen and nitrogen, the metal becomes much softer. The electrorefining cell used in the vanadium purification process was developed originally to refine titanium and similar highly reactive metals.

### Ketjen Add Two Carbon Blacks to Product Range

The new Botlek, Netherlands, plant of Ketjen Carbon is now producing Ketjen-black LHI, a low hardness ISAF, and Ketjenblack CR, a channel replacement oil black. The plant, owned 60% by the Royal Sulphuric Acid Works Ketjen Ltd., and 40% by Cabot of the U.S., has an annual capacity of 24,000 tons a year, more than half of which is for export.

### Calspray Plan \$22 Million Nitrogen Fertiliser Plant

California Spray-Chemical, a subsidiary of Standard Oil of California, plan a \$22 million nitrogen fertiliser plant at Fort Madison, Iowa. The new facilities will produce 300 tons a day of anhydrous ammonia, 150 tons of prilled ammonium nitrate and 600 tons of complex pelleted fertilisers. Construction is due to begin in the autumn and is scheduled for completion by September 1961.

### Dow Corning Set Up Two Overseas Subsidiaries

Dow Corning Corporation, Midland Mich., have formed two new overseas subsidiaries—Dow Corning AG, Basle, Switzerland, and Dow Corning International S.A., Panama. This development is designed to facilitate service to licensees and overseas customers. Dow Corning

AG will finance and manage certain overseas interests of the U.S. company but will not engage in manufacturing operations in Switzerland.

### Chemboard Plants to be Built Throughout World

Emerite Corporation, Jackson, Miss., have appointed the Girdler Construction Corporation, Louisville, Ky., to engineer and construct plants throughout the world to produce a composition board named Chemboard. This board can, it is said, be made from any lignocellulose material.

### 1.5 Million-Tonnes Throughput Refinery at Emden

A new mineral oil refinery is to be opened in the north German port of Emden this month by the Swiss industrialist, G. Duttweiler. The refinery, for which crude oil has already been ordered for the next 15 years, will have an initial throughput of 1.5 million tonnes.

### New U.S. Titanium and Zirconium Fabricating Unit

Fabrication of titanium and zirconium will begin before the end of 1960 at the \$1.6 million plant at Inkster, Mich., of the Wolverine Tube Division of Calumet and Hecla. Initially, tubes up to 2½ in. outside diameter and rods in diameters up to 2 in. will be produced. Other finished forms will be produced at a later stage.

### P.V.C. Production Doubled in Japan

Production of p.v.c. in Japan in 1959 exceeded 20,000 tonnes, more than double the 1958 figure, states the Japan Rigid P.V.C. Sheet Association.

## Moulded Graphite Produced Faster and Cheaper by New U.S. Process

DETAILS of a new method of producing moulded graphite which reduces time and cost by combining carbonisation and graphitisation in one process have been released by the U.S. Atomic Energy Commission. The process was developed under A.E.C. contract by the Armour Research Foundation of the Illinois Institute of Technology.

In conventional graphite manufacture, a carbonaceous material such as petroleum coke is mixed with a 'binder' such as coal tar pitch before being carbonised at up to 2,700°F. After cooling, the resultant carbon is reheated to about 5,000°F, which crystallises it to form graphite.

In the Armour process, carbonisation and graphitisation are combined in a single heating and cooling cycle. A synthetic binder, furfuryl alcohol, is combined with petroleum coke and heated directly to the graphitisation temperature without intermediate cooling. Carbonisation takes place during the early stages of heating. Since furfuryl alcohol is a thermosetting material, a body fabricated

with this binder does not require support during the carbonising phase as does a body utilising conventional binders, which tend to liquefy at high temperatures. This eliminates the necessity for cooling down and removing the specimen following carbonisation. The A.R.F. single-cycle process cuts the time necessary for making laboratory graphite specimens of comparable size from nearly two weeks to about two hours.

Although the largest specimens produced to date by the new process have been of the order of 1½ in. by 1½ in. by 4 in., it is believed that the process can be adapted to making the larger sizes required for commercial application. Process time would, of course, be longer than for laboratory specimens, but would still be substantially less than for the conventional process.

The A.E.C. have a particular interest in graphite, of course, as a moderator for atomic reactors, but the same method can be used to produce graphite for non-nuclear applications.

# U.K. Chemical Exports and Imports in First-half 1960

EXPORTS	QUANTITY		VALUE	
	January 1959	June 1960	January 1959	June 1960
<b>INORGANIC</b>				
Acids . . . . . Cwt.	90,190	163,322	326,176	438,491
Copper sulphate . . . Tons	25,470	18,639	1,695,714	1,463,144
Sodium hydroxide . . Cwt.	2,497,547	2,539,369	3,035,744	2,792,372
Sodium carbonate . . "	2,133,066	1,937,692	1,361,122	1,148,555
Aluminium oxide & hydroxide . . . Tons	18,729	16,404	667,782	609,038
Aluminium sulphate . "	15,305	18,332	204,469	236,874
Other al. cpds. . . . "	2,449	1,858	102,267	80,154
Ammonia . . . . . Cwt.	42,488	51,275	160,158	191,916
Ammonium cpds. (not fertilisers or bromides) . Tons	8,273	12,088	305,493	410,813
Arsenical cpds. . . . "	1,556	2,588	112,579	176,930
Bismuth compounds . Lb.	175,895	209,550	141,466	164,578
Chloride of lime . . . Cwt.	147,117	185,691	247,901	332,465
Hydrosulphite . . . "	55,847	40,557	410,775	316,687
Other bleaching mats. . "	79,996	127,784	375,349	582,647
Calcium cpds. . . . "	214,826	207,265	413,933	404,173
Carbon blacks . . . . "	454,236	654,064	1,702,244	2,353,328
Cobalt cpds. . . . . "	8,878	8,173	265,879	215,981
Iron oxides . . . . . "	55,141	61,167	174,403	187,181
Lead cpds. . . . . "	34,192	33,695	160,965	162,261
Magnesium cpds. (n.e.s.) Tons	19,669	9,300	736,337	493,986
Nickel salts . . . . . Cwt.	45,227	58,567	412,956	537,074
Potassium cpds. (not fertilisers or bromides) . . . "	36,799	41,482	315,311	371,556
Sodium bicarbonate . . "	363,703	360,527	321,503	336,442
Chromate & dichromate . . . . . "	39,248	15,753	169,253	71,759
Phosphates . . . . . "	130,857	156,440	509,121	572,975
Silicate . . . . . "	138,612	144,696	136,406	143,973
Other sodium cpds. . . "	703,950	730,928	1,745,117	1,735,083
Tin oxide . . . . . Tons	5,468	3,670	187,307	132,280
Zinc oxide . . . . . "	5,502	4,485	413,242	368,721
Inorganic elements & cpds., n.e.s. . . . .	—	—	2,465,449	3,043,380
<b>ORGANIC</b>				
Acids, anhydrides, salts & esters . . . . . Cwt.	29,859	13,932	1,252,488	1,453,545
Glycerine . . . . . "	—	—	330,308	173,363
Ethyl alcohol, etc. & alcohol mixtures, n.e.s. Cwt.	63,224	44,107	959,854	1,996,223
Acetone . . . . . "	28,582	33,466	176,923	123,190
Citric acid . . . . . "	—	—	269,816	284,744
Gases, compressed, liquefied or solidified, n.e.s. . . . . Cwt.	102,019	128,109	596,396	805,055
Phenol . . . . . Lb.	335,308	416,784	87,556	89,802
Salicylates . . . . . Cwt.	17,942	21,488	283,833	347,434
Sodium cpds. . . . . "	619,868	709,710	364,258	398,610
Sulphonamides, not prepared . . . . . Lb.	38,147	42,639	707,777	709,366
Dye intermediate n.e.s. Cwt.	—	—	9,256,103	11,244,645
Organic cpds., n.e.s. . . .	—	—	34,232,474	38,715,921
<b>MISCELLANEOUS</b>				
Coal tar . . . . . Tons	28,285	32,851	330,710	371,109
Cresylic acid . . . . . Galls.	1,462,300	1,914,881	490,698	676,914
Croosote oil . . . . . "	11,409,214	8,453,819	694,140	562,069
Other tar/chems. . . . Value	—	—	280,615	359,257
Total . . . . .	—	—	1,796,163	1,969,349
Pigment dyestuffs . . Cwt.	16,893	21,878	721,921	962,320
Other syn. org. dyes . "	91,082	112,937	4,748,809	5,746,087
Drugs, medicines, etc. . "	—	—	20,094,242	22,822,653
Essential Oils, etc. . . "	—	—	12,647,476	13,530,684
Explosives . . . . . "	—	—	5,412,132	5,082,530
Tetraethyl lead . . . . Gall.	3,069,097	3,147,274	6,305,767	6,244,564
Gas & chem. machinery Cwt.	74,889	80,186	2,862,129	1,791,386
<b>FERTILISERS, ETC.</b>				
Ammonium nitrate . . Tons	—	—	30,750	11,009
Ammonium sulphate . . "	—	—	981,664	1,165,456
Other fertilisers . . . "	—	—	145,510	186,691
Disinfectants, etc. . . Cwt.	62,019	66,745	404,432	447,857
Insecticides . . . . . "	169,676	136,673	2,200,347	2,052,628
Fungicides . . . . . "	35,156	53,499	795,027	647,312
Weedkillers . . . . . "	—	—	—	—
<b>PLASTICS</b>				
Plastics materials . . Cwt.	1,503,174	1,787,654	19,083,211	22,908,954
Of which acrylic sheet, etc. . . . . "	57,443	66,611	1,758,122	2,028,647
Alkyd resins, etc., dispersoids . . . . . "	39,421	60,684	390,294	577,590
Aminoplastics . . . . "	175,004	181,305	1,326,794	1,391,771
Cellulose plastics . . . "	39,746	53,419	806,596	1,105,269
Phenolics & cresylics . "	128,481	158,570	1,888,532	2,359,056
Polystyrene . . . . . "	132,741	99,815	1,416,184	1,051,854
Polythene sheet, etc. . "	20,665	18,918	378,165	375,360
Polyvinyl chloride . . "	296,512	354,592	3,514,314	5,069,486

IMPORTS	QUANTITY		VALUE	
	January 1959	June 1960	January 1959	June 1960
<b>INORGANIC</b>				
Boric acid . . . . . Cwt.	41,440	71,551	£ 134,098	£ 241,997
Arsenic trioxide . . . Tons	2,087	2,547	83,877	78,741
Aluminium oxide . . . "	6,620	14,518	408,641	914,183
Silicon carbide . . . . "	4,600	7,262	498,517	755,551
Borax . . . . . Cwt.	259,769	271,554	552,843	586,381
Calcium carbide . . . . "	586,644	1,185,082	1,071,705	2,030,612
Channel black . . . . . "	79,399	83,597	474,745	551,438
Other carbon blacks . . "	73,642	86,892	329,597	385,962
Cobalt oxides . . . . . "	4,743	5,822	233,384	243,857
Iodine . . . . . Lb.	555,237	802,831	170,983	265,400
Mercury . . . . . "	841,155	868,163	810,816	797,883
Sodium, calcium, potassium, lithium . . . Cwt.	83	505	10,209	18,922
Potassium carbonate . . "	54,648	77,400	170,806	240,158
Selenium . . . . . Lb.	88,612	174,381	235,810	407,683
Silicon . . . . . Tons	3,483	4,809	500,806	709,107
Sodium chlorate . . . Cwt.	71,330	71,781	219,857	193,660
Titanium oxides . . . "	32,825	10,162	87,517	84,677
Inorganic elements & cpds., n.e.s. . . . .	—	—	2,987,052	4,284,543
<b>ORGANIC</b>				
Acids, anhydrides, salts & esters . . . . . "	—	—	978,011	3,262,771
Glycerine . . . . . Cwt.	84,768	78,466	669,392	629,432
Menthol . . . . . Lb.	103,657	93,433	182,402	191,708
Alcohols & mixtures . n.e.s. . . . .	—	—	1,984,394	1,905,848
Spirits of turpentine . Gall.	308,635	114,260	71,896	29,715
Styrene monomer . . . "	843,015	1,263,139	350,864	505,115
Vinyl acetate monomer. Tons	3,649	3,870	398,107	438,269
Organic cpds., n.e.s. . . Value	—	—	9,677,301	14,066,627
<b>MISCELLANEOUS</b>				
Syn. org. dyestuffs . . Cwt.	18,260	25,005	1,791,166	2,268,822
Drugs & medicines . . . "	—	—	2,092,221	2,426,690
Plastics materials . . Cwt.	485,090	967,975	8,983,450	15,081,080
Of which alkyd resins, cellulose plastics . . . . . "	15,601	28,032	156,715	292,528
Polyvinyl chloride . . . "	38,726	51,723	1,990,566	2,458,124
Polyvinyl chloride . . . "	155,674	366,457	1,850,948	3,416,574
Other plastics . . . . . "	275,089	521,763	4,985,221	8,913,854
Total . . . . .	485,090	967,975	8,983,450	15,081,080
<b>FERTILISERS,</b>				
Basic slag . . . . . Tons	48,720	51,712	381,510	414,088
Potassium chloride . . "	5,750,322	7,092,162	4,738,607	5,405,108
Potassium sulphate . . "	253,183	253,447	228,905	6,958,347
Other fertilisers . . . "	34,321	27,515	2,661,437	2,490,917
Disinfectants, insecticides, etc. . . Cwt.	34,321	27,515	2,661,437	2,490,917

## TRADE WITH PRINCIPAL MARKETS

Country	IMPORTS		EXPORTS	
	January-June 1959	January-June 1960	January-June 1959	January-June 1960
	£	£	£	£
Ghana . . . . .	—	—	3,117,293	3,129,487
Nigeria . . . . .	—	—	3,394,015	3,947,405
South Africa . . . . .	1,205,294	1,360,947	5,816,184	6,958,347
Rhodesia & Nyasaland . . . . .	80,930	103,107	1,206,660	1,331,926
India . . . . .	251,103	586,971	8,151,919	7,145,320
Pakistan . . . . .	—	—	1,243,640	3,222,858
Singapore . . . . .	214,672	255,719	1,976,406	1,856,958
Malaya . . . . .	155,056	157,737	1,868,082	2,546,649
Ceylon . . . . .	141,741	133,227	1,909,755	1,886,704
Hongkong . . . . .	96,366	39,532	2,663,803	3,321,548
Australia . . . . .	229,387	261,270	11,402,663	12,337,394
New Zealand . . . . .	529,184	554,559	3,106,005	3,695,932
Canada . . . . .	3,761,609	5,203,684	4,360,135	4,141,166
Eire . . . . .	198,875	294,976	4,136,577	4,564,176
Soviet Union . . . . .	146,519	355,425	937,230	3,299,804
Finland . . . . .	—	—	1,639,962	1,986,761
Sweden . . . . .	1,217,409	1,569,086	4,241,362	5,399,199
Norway . . . . .	1,858,165	2,261,444	2,595,404	2,846,472
Denmark . . . . .	279,791	503,258	2,639,905	2,910,031
Poland . . . . .	956,246	876,096	674,904	705,332
West Germany . . . . .	11,276,646	14,339,114	4,957,296	6,189,940
East Germany . . . . .	1,104,307	1,669,691	—	—
Netherlands . . . . .	4,650,917	6,896,134	5,844,007	7,919,002
Belgium . . . . .	2,408,467	2,339,144	3,364,848	3,573,694
France . . . . .	5,827,894	7,968,934	3,857,286	4,128,334
Switzerland . . . . .	2,952,292	3,758,910	1,684,654	2,087,315
Portugal . . . . .	511,104	515,246	1,664,094	1,857,010
Spain . . . . .	1,163,023	1,385,635	845,873	1,418,087
Italy . . . . .	1,866,590	3,607,154	4,686,298	5,731,483
Austria . . . . .	—	—	612,976	706,934
Turkey . . . . .	—	—	1,753,491	543,895
Iran . . . . .	—	—	1,813,314	1,798,899
Burma . . . . .	—	—	1,059,098	1,529,439
China . . . . .	472,035	231,822	1,191,771	1,828,758
Japan . . . . .	565,298	653,343	1,520,198	1,858,718
United States . . . . .	14,640,916	24,562,399	5,647,972	5,660,858
Argentina . . . . .	408,944	516,737	2,666,616	1,311,130
<b>TOTALS (all chemicals)</b>	<b>62,340,429</b>	<b>87,491,211</b>	<b>142,251,867</b>	<b>168,024,861</b>

# DETERMINATION OF BERYLLIUM AND ESTIMATION OF IMPURITIES

## A.E.A. Symposium at Blackpool

BEFORE the discovery of the value of beryllium as an alloying agent in the 1920's, and the advent of nuclear fission, the element was mainly a laboratory curiosity, but for some years now great interest has been shown in the production of high-purity beryllium metal, and consequently the analytical chemistry of the metal and its compounds has been rapidly developed.

The problem of beryllium determination and the estimation of impurities was discussed at a symposium held by the U.K. Atomic Energy Authority Production Group at Blackpool on 23 June. In his opening remarks, Mr. K. B. Ross, the Director of Operations, Risley, stressed the importance of the analyst. The atmospheric tolerances for beryllium are, from a health point of view, so restrictive that if the analyses are biased the capital cost of plant can become prohibitive, and the metal could be excluded from use in any field.

### Main Weakness

Beryllium is being used increasingly as a nuclear fuel element canning material. Its main weakness as a structural material is its lack of ductability and its brittleness. It has been concluded from some work that the brittleness is inherent in the metal but others have suggested that it may be related to oxygen content. In view of the conflicting opinions it has been necessary to develop reliable analytical methods for the determination of oxygen. Existing methods can be divided into three main groups: vacuum fusion techniques; chemical methods; and activation methods. The first two groups were dealt with in a paper by A. Parker.

In the vacuum fusion method the metal is introduced into a bath of molten metal, e.g., platinum or iron, contained in a graphite crucible. The oxide of the metal is reduced by the dissolved carbon giving carbon monoxide. This, together with the hydrogen and nitrogen resulting from the thermal decomposition of hydrides and nitrides, is pumped rapidly away from the neighbourhood of the crucible and the gas mixture is analysed. This method of vacuum fusion has a number of advantages; it is versatile and is not dependent on the type of beryllium, giving satisfactory results on materials from powder to ingot and is not affected by the temperature of the production of the beryllium.

On the other hand, there are also several disadvantages. In addition to the elaborate apparatus required, it is found that for beryllium the operating conditions are far more critical than for other metals and that the ratio of beryllium to platinum must be kept low thus limiting the number of determinations that can be carried out at each run.

Two types of chemical methods were described in the paper: volatilisation of beryllium as the chloride, leaving residual oxide; and selective solution of the metal, leaving unattacked oxide.

Volatilisation can be carried out by means of either hydrogen chloride or chlorine. In the first case, a stream of dry hydrogen chloride is passed over the beryllium contained in a boat and the temperature is gradually raised to 600°C. At the end of the heating period the tube containing the boat is purged with dry nitrogen, the boat is removed and ignited at 800°C. The residual oxide can be weighed and its beryllium content determined absorptiometrically as the acetyl acetate or as the *p*-nitrobenzeneazoorcinol complex. The chlorine volatilisation method is similar in principle. Chlorine is passed over heated beryllium, the chloride volatilises and the residual oxide is determined.

Methods based on volatilisation procedures have been used mainly for beryllium containing 0.1 to 2% of oxygen, but they can be useful at lower levels provided that great care is taken to dry the gas stream.

Three methods based on selective solution were described; in hydrochloric acid, buffered copper sulphate solution and methanolic bromine. After the solution of beryllium in hydrochloric acid, the oxide was filtered off and determined as the *p*-nitrobenzeneazoorcinol complex. The process with the copper sulphate solution is more complex involving as it does the separation of the copper deposited during the reaction. Satisfactory

results from the selective solution of beryllium by methanolic bromine were obtained with flake metal but powder and cast metal gave high results compared with other methods.

There are several problems connected with the selective solution methods, the chief of these being whether all the beryllium can be dissolved, together with any carbides or silicates, without any oxide going into solution. In practice, the condition of solution of the sample can be adjusted so that no oxide is dissolved, but this is only feasible when the past history of the beryllium is known; so that methods based on selective solution are only suitable for process control.

The selection of a method of oxygen analysis depends upon the expected oxygen content and the amounts and form of the sample available. Both the vacuum fusion and hydrogen chloride methods are of general use provided that in the latter case the oxygen content is relatively high and that a sufficient quantity of sample is available.

Other papers presented at the symposium were: "Determination of oxygen in beryllium by activation of analysis," R. F. Coleman; "The absorptiometric determination of beryllium," T. J. Hayes; "Methods of beryllium determination used at the National Chemical Laboratory," E. C. Hunt and J. V. Martin; "Alpha and gamma irradiation techniques for beryllium determination," H. Bisby and F. H. Hale; "The determination of beryllium by photoneutron method," G. W. C. Milner and J. W. Edwards; "Physical methods for the analysis of beryllium," M. S. W. Webb and M. I. Shalovsky; "The spectrochemical determination of beryllium in air, swabs, urine and biological tissue," A. E. Sawyer; "The fluorimetric estimation of microgramme quantities of beryllium in laboratory and workshop atmospheres," H. F. Molineux, F. Trowell and G. B. Turnbull.

## Plutonium-in-air Alarm Monitor

AMONG the advanced nucleonic instruments that the Atomic Weapons Research Establishment, Aldermaston, is sending to the Fifth International Instruments and Measurements Conference, to be held in Stockholm 13-16 September, is a plutonium-in-air alarm monitor, believed to be the only one of its type in the world. It carries out a continuous sampling of air for plutonium  $\alpha$  activity. The plutonium dust particles are impacted on to a zinc sulphide coated film that is measured continuously with an  $\alpha$  scintillation counter. The impactor collects particles of about 1 micron in size, such as those of plutonium, more readily than it does smaller particles like those of radon or thoron decay products, which are swept through. When the monitor is in operation the pulses from the scintillation counter are integrated at the remote scaler, the alarm trip circuit being pre-set to operate at a known number of counts (equivalent to a particular concentration of plutonium in air).

Provision can be made for both aural

and visual indication, or the alarm could be arranged to trigger, for instance, a reactor control mechanism.

## U.S. Monograph on Low Temperature Materials

A NEW publication on 'Mechanical properties of structure materials at low temperatures—a compilation from the literature', R. M. McClintock and H. P. Gibbons, has been issued by the U.S. National Bureau of Standards (U.S. Government Printing Office, Washington 25, D.C., \$1.90, including postage).

Intelligent design of reliable cryogenic equipment requires data on the mechanical properties of structural solids at low temperatures. This monograph is issued to help fill the need for a compilation of useful design figures. It includes tensile strength, yield strength, tensile elongation, and impact energy of about 200 materials, metallic and non-metallic, given graphically as functions of temperature between 4 to 300°K.

## Chemist's Bookshelf

# BASIC CHEMICAL ENGINEERING

FUNDAMENTALS OF CHEMICAL ENGINEERING OPERATIONS. By M. G. Larian. Constable and Co., London, 1959. Pp. xi + 644. 82s 6d.

Twenty years ago the student of chemical engineering had only two or three text books to help him to study his subject. Now there is a significant new text appearing about every six months. This change is not only symptomatic of the growth in importance of the subject but is a good thing in itself. No single book can hope to cover every section of the basic chemical engineering course so that the student can comprehend each part equally. Much of the advantage of reading text books lies in the comparison of the different methods of treating the same topic and the student can learn a great deal from this. Thus today's student of chemical engineering is more fortunately placed and this increase in good texts is to be welcomed as an essential feature of improving the education of chemical engineers.

Professor Larian's book is a worthwhile addition to the range of texts currently available. Although at first sight it appears to be 'The mixture as before', it in fact is written in a refreshing style, which this reviewer found easy to read,

and to have a well presented argument.

After a brief introduction on units and dimensions the author then treats flow of fluids, heat transfer and evaporation in the first quarter of the book.

General principles of mass transfer are then covered and types of processes and apparatus considered. The important case of simultaneous heat and mass transfer is given a separate chapter at the end of this section which thus completes the first part of the book.

The second part deals with separation of mixtures by interphase mass transfer operations and covers the operations of drying, distillation, extraction, leaching and absorption. The treatment is conventional but thorough and covers all that is normally encountered in the undergraduate course.

The third and final section of the book is concerned with mechanical separation of heterogeneous mixtures. Two chapters comprise this section, the first dealing with principles and practice of particle separation, thickening and classification and the second treating of filtration.

The format of the book is attractive and the only thing likely to dissuade the student from acquiring this useful book is the price.

D.C.F.

## 'Useful Addition' to Literature on Low Temperature Techniques

LOW TEMPERATURE TECHNIQUES. By E. Din and A. H. Cockett. George Newnes, London, 1960. Pp. 216. 40s.

Since the war the emphasis of low temperature research has shifted largely into the field of practical applications. Not only has the traditional subject of gas liquefaction assumed very large proportions but the use of missiles and the introduction of switching devices or amplifiers operating at helium temperatures is beginning to make new demands. Books which will help engineering students and laboratory workers to master this new field are therefore particularly welcome.

The present volume in the Practical Science Book series begins with an introductory chapter, dealing mostly with the history of the subject, which is followed by sections setting out the methods of producing and measuring low temperatures. Here the authors confine themselves to the subject matter usually found in the standard textbooks on heat and thermodynamics. The next chapter on 'low temperature techniques in the laboratory' deals mainly with the description of cryostats and while this is useful, one may regret that the authors

have not found space for the more practical aspects such as solders, adhesives, methods of leak detection and the many other techniques having special significance in low temperature work. These are aspects of very great importance for the practical worker and perhaps, in a second edition, the authors can be persuaded to sacrifice some of the well-known material in other chapters in favour of more practical advice.

This is particularly true for the next chapter on low temperature properties of materials which, in addition to a great number of most useful data, contains rather too much text book stuff on superconductivity and liquid helium. In the two final chapters on gas separation and refrigeration in industry, the authors are very much in their own element and are giving a very lucid and crisp account of the problems involved.

There are some statements, for instance that the unattainability of absolute zero is a consequence of the second law of thermodynamics, with which one may not always agree, but these do not detract from the general usefulness of the book.

K. MENDELSSOHN

## High Pressure Process Engineering

THE DESIGN AND CONSTRUCTION OF HIGH PRESSURE CHEMICAL PLANT. By H. Tongue. Chapman and Hall, London. Pp. xii + 250. 84s.

This is a second edition, written after an interval of 26 years and therefore the book is almost a new work. The second edition has maintained the very high quality and value of the first edition.

It tells the story clearly, logically and simply, and nothing appears to have been missed out. The subject is to a large extent bound up with statutory and other codes and this aspect has not been lost sight of, indeed in one sense the book is written round this aspect. There is a considerable amount of 'know-how' in the text and yet there is no suggestion that the design of pressure vessels is deceptively easy.

After a brief but adequate indication of the statutory and other requirements, the design of pressure vessels is discussed in detail, covering methods of construction and also materials. Following this, there is a description of the various ancillary apparatus required in connection with high pressure plant. Certain processes which are operated at high pressures are then briefly discussed largely to indicate the place of pressure vessels in the scheme. A chapter on pipes, valves and fittings completes the book.

It is well made and profusely illustrated, as indeed such a book should be. The drawings are clear. It is a book intended for hard usage and is well worth the price charged for it.

## Approved Methods for Water Examination

Further edition of the book 'Approved methods for the physical and chemical examination of water' has been published by The Institution of Water Engineers. The first edition originally appeared in the form of a special issue of the *Journal of the Institution of Water Engineers* in 1949 and was subsequently reprinted as a book in 1950. The chief revisions or additions in this third edition include those sections dealing with the determination of nitrate, sulphate, sodium and potassium, aluminium, copper, lead, zinc, and synthetic anionic detergents. A brief index is also included.

## The Periodic Table

Second edition of 'The Periodic Table' by D. G. Cooper, is published by Butterworths Scientific Publications at 7s 6d. The book presents a concise and readable account of the Periodic Table and its applications and completely dispels any idea that chemistry consists of a "mass of unrelated facts." In the present edition two further chapters have been included dealing with the main factors governing the occurrence of the elements in nature, and with the radioactive elements. Notes on ionic potential and the quantitative aspect of electro-negativity have also been added to earlier chapters.

## Chemist's Bookshelf

# PRECIPITATION PROCESSES

HETEROMETRY. By *M. Bobtelsky*. Elsevier, Amsterdam, 1960. Pp. vi + 229. 42s.

The first reaction of the chemist who picks up this book is likely to be: "Heterometry? What's that?" However, if he is interested in the processes by which precipitates are formed, he should persevere further, for he may obtain a closer insight into these processes by a study of this text. Heterometry, or better, heterometric titration, is essentially a measurement of the light absorption of the primary particles of a precipitate formed by titrating an ion with some suitable precipitant. The method should not be confused with turbidimetry which is a static process where the precipitate is maintained as a suspension for comparative measurement. In heterometric titrations, a plot of the light absorption against the volume of titrant added yields a curve with breaks which may indicate the formation of different complexes. The technique can be used quantitatively by titration to maximum turbidity and it is also possible to determine different metals simultaneously by using separate breaks in the curve. However, it would seem that heterometry will be more valuable in studies of the formation of insoluble complexes rather than in quantitative analysis.

Professor Bobtelsky, being the inven-

tor and principal propagator of the technique, writes with great enthusiasm. He deals with the development and scope of heterometry and its relationship to other physicochemical methods such as turbidimetry, conductometry and potentiometry. Its general analytical aspects are briefly discussed and the main part of the book deals with normal salt analysis, chelated salt analysis, and the study of complex chemistry, chemical reactions, heterogeneous chain reactions and intermediate and final compounds in precipitation processes. Something of the bias is shown by the fact that more than two-thirds of the reference list consists of the author's own papers.

Although the text is interesting, it could have been made much more palatable to the reader. There are far too many tables of results which would better have been discussed in the text; in a monograph which seeks to popularise a virtually unused technique, the reader should not have to dig for his information.

This is in many ways an interesting monograph which furthers fundamental studies of precipitation processes; the procedure may also be useful in the quantitative analysis of traces. As is usual with Elsevier publications, the book is beautifully produced.

A. M. G. MACDONALD

## Comprehensive Work on N.M.R.

HIGH-RESOLUTION NUCLEAR MAGNETIC RESONANCE. By *Pople, Schneider and Bernstein*. McGraw-Hill, London, 1959. Pp. 501. 104s 6d.

No physical phenomenon of application to the determination of molecular structure has been developed with greater rapidity than that which involves the absorption of energy from an oscillating magnetic field by atomic nuclei possessing finite magnetic moments. The exact frequency at which the resonance absorption of energy occurs for a particular nucleus is governed not only by the applied magnetic field but also by the local field around the nucleus which will depend mainly on its chemical environment. The investigation of nuclear magnetic resonance (N.M.R.) spectra therefore provides a subtle means of attack on problems of intimate molecular structure and of intermolecular effects. The frequency of the response in the applied field, that is, its chemical shift compared to some reference compound, is an indication of its environment while intensity considerations give direct information about the relative numbers of equivalent nuclei. Broadly speaking, it is only in the liquid and gaseous states, where magnetic dipolar interaction is minimised, that

narrow line spectra suitable for the measurement of chemical shifts are obtained and it is with developments in this field that the present monograph is concerned.

The book is divided into two parts, the first dealing with theoretical principles and experimental methods while the second deals with applications in a wide field of chemistry ranging from problems of molecular isomerism to reaction rates and quantitative analysis.

This is an important book, mainly on account of its comprehensive treatment of the theory of the subject which is unlikely to be seriously outdated for many years. The chapter on experimental methods will be equally useful both to experimenters involved in setting up their own equipment and also to those luckier mortals endowed with sufficient cash to purchase one of the commercial instruments now available. There is also an excellent bibliography with no less than 474 references to the published literature. The authors are to be congratulated on their success. This book will automatically go on the library list of every research worker or organisation interested directly or indirectly in N.M.R.

R. C. PINK

## Prof. Adams Reaches Vol. 10 in Series on Organic Reactions

ORGANIC REACTIONS, VOL. X. Edited by *Roger Adams*. Wiley, New York (Chapman and Hall, London), 1959. Pp. vii + 563. 96s.

This series of volumes, well known to organic research chemists, began in 1942, and a word of congratulation to the editorial board, under the chairmanship of Professor Roger Adams, and to the publishers, would be most appropriate, now that the tenth volume has been reached. But after Volume I had been launched, and received with such enthusiasm by organic chemists everywhere, it was clearly only a matter of time before others followed.

The general purpose of the series is familiar: it is to provide comprehensive surveys of selected organic reactions. The newest part deals with three such topics. The first two chapters cover closely related reactions: the coupling of diazonium salts with aliphatic carbon atoms (by S. M. Parmerter), and the Japp-Klingemann reaction (by R. R. Phillips), which is a special case of this coupling reaction, involving the simultaneous elimination of a group. The third and final chapter is on the Michael reaction (by E. D. Bergmann, D. Ginsburg and R. Pappo), and occupies two-thirds of the volume.

The arrangement of the material in each chapter is the same as in the earlier volumes. First, there is an introduction, defining the reaction under discussion, followed by sections on the mechanism, scope and limitations, synthetic applications, and experimental procedures. Finally, there are the valuable tabular surveys of examples of the reactions. Here these cover the literature up to the end of 1955, but some more recent examples are included.

If special mention be made of the third chapter, it is because of the size of the task the authors have undertaken in reviewing a reaction discovered nearly 75 years ago, and still one of the most important in synthetic organic chemistry. The reaction has been given its widest interpretation, to include addends and acceptors activated by groups other than carbonyl and carbalkoxyl. There are well over 1,000 references here.

As with previous volumes, the book is beautifully printed and bound, and in every respect the high standard of its predecessors has been fully maintained.

A. R. PINDER

## A.E.R.E. Unclassified Publications

Further unclassified publications have been issued by the U.K. Atomic Energy Authority and are available from H.M.S.O. They include: 'The analysis of beryllium by fluorescent X-ray spectrography'; 'Critical assemblies of aqueous uranyl fluoride solutions, Part 4'; and 'The removal of  $^{137}\text{Cs}$  and  $^{90}\text{Sr}$  from aqueous solution by ion exchange on vermiculite.'

## Paper-back Manual on I.R. Spectroscopy

AN INTRODUCTION TO PRACTICAL INFRARED SPECTROSCOPY. By A. D. Cross. Butterworths, London. 1960. Pp. 80. 17s 6d.

An obvious gap in the literature has been filled by this little manual, whose limited but laudable aims are clearly stated in its preface (by Dr. H. W. Thomson), foreword (by Prof. D. H. R. Barton) and introduction. The recent introduction of comparatively cheap bench-type spectrometers has made organic chemists increasingly infra-red conscious: students and research workers who wish a helpful introduction to the practical techniques and applications of modern infra-red spectroscopy will find this book by Dr. Cross of great value.

Much useful information has been packed into its 80 pages, which include an index and reciprocal table; a chart gives comparative data concerning the current commercial spectrometers. Part I (46 pages) never pretends to be other than an elementary introduction. It includes short sections on theory, uses, instrumentation, cells and sampling techniques, quantitative analysis, hydrogen-bonding and hints on interpretation of spectra: mere mention is given to more specialised techniques such as the use of polarised radiation, aqueous solutions, deuteration, etc. Sound advice is offered throughout, particularly on topics such as sources of error and limitations to accuracy. The point is made (p. 7) that in spectroscopy there is no substitute for experience.

Part II is largely devoted to comprehensive correlation charts (6 pages) and group frequency tables (19 pages). The strong warning given (p. 47) on the inevitable result of indiscriminate use of these tables by inexperienced persons is absolutely essential, and is strikingly reminiscent of that which prefaces the first edition of Dr. Bellamy's now classic hand-book on interpretation, which this hand-book should supplement rather than replace.

This paper-backed manual is a credit to its author, publishers and printers; it is excellently written and produced, and sensibly priced. A copy should be available beside every spectrometer in teaching establishments and in general laboratory use in industry.

D. M. W. ANDERSON

## Scientific Research in British Universities

The Department of Scientific and Industrial Research publication, 'Scientific Research in British Universities,' is available from H.M.S.O., price 25s. This publication, the only one of its kind in the U.K., provides brief notes on scientific research in progress in British universities, university colleges and associated institutions during the academic year 1959-60. The entries are arranged in subjects in alphabetical order of university, and name and subject indices are provided.

## Chemist's Bookshelf

# AROMATIC SUBSTITUTION

AROMATIC SUBSTITUTION NITRATION AND HALOGENATION. By P. B. D. de la Mare and J. H. Ridd. Butterworths, London. 1959. Pp. 250. 50s.

It is probably true to say that the phenomena of aromatic substitution are fundamental to my rational electronic theory of organic reactions. This is not only so in an historical sense, but also because simple substitution processes where hydrogen is replaced by a hetero atom, or group are characteristic features of the reactions of aromatic systems. Furthermore the character of the aromatic nucleus in many cases promotes the formation of relatively stable addition complexes which approximate to the actual activated complex of a bimolecular substitution process.

The present monograph is restricted to the two most familiar electrophilic aromatic substitution processes, nitration and halogenation. This restriction is to some extent justified in the thorough and authoritative treatment which the authors have been able to give here, within the compass of some 250 pages. At the same time, the reader may well feel that a more balanced picture of aromatic substitution should include nucleophilic processes as well. One might even ask whether it is really justifiable to regard electrophilic and nucleophilic phenomena as fundamentally different.

The book contains much useful kinetic data, each chapter concluding with an excellent bibliography. The section in chapter III which describes reaction paths and intermediate complexes is interesting, but in view of its fundamental importance, more detailed treatment might have been given, particularly of the  $\pi$  complex. The concluding chapter of the book describing theoretical approaches leaves one with the feeling that a more complete picture could have been given. For instance the relevance of the Hammett equations to ionisation potentials might have been discussed.

My overall impression would have been that the authors have tended to think almost exclusively in terms of heterocyclic processes, without giving sufficient weight to the consequences of Mulliken's theory of dative complexes. Moreover the value of the work would be considerably enhanced by thermodynamic treatment of the kinetic data in terms of entropies of activation.

This book is very good value at 50s., taking account of the valuable factual content and first class production.

J. H. TURNBULL

## Compression Distorts Story of Chemistry

THE STORY OF CHEMISTRY. By Georg Lockemann. Peter Owen Ltd., London. 1960. Pp. 277. 30s.

It would be difficult indeed to give unqualified commendation to any feature of this book. Perhaps it would be unjust to lay all its too numerous shortcomings at the door of the author, whose book in German in the Götschen collection is known to us. Although there is no explicit indication that the present work is a translation, frequent peculiar turns of phrase and persistent and repeated misprints (e.g. 'mongering' for 'mongering' on pp. 4 and 43) seem to betray that it is. Assuming that the work has been translated, the further assumption that the translator was unacquainted with chemistry and physics would explain the startling version of the gas law given on p. 219, namely: ' $p + v = \text{const.}$ ' or ' $(p + a/V_2)(v - b) = R + T$ '. Such leniency, however, is difficult to accord to the peculiar version of the phase rule on the preceding page: ' $P + F = 3$ '. Our industrial colleagues will find difficulty in recognising a tower 'in which a mixture of nitro-sulphuric (sic) acid and chamber acid trickles down a filter bed' as the venerable invention of John Glover.

The plan of the book is conventional, taking the reader from the chemical notions of the ancients, through alchemy and iatrochemistry to scientific chemistry,

which arose from establishment in the eighteenth-century of effective theories of combustion and an understanding of the quantitative character of the transformations of matter. Throughout it is assumed that the reader is acquainted with chemistry to such a level that he will take ' $\delta$ -oxide cyclo-semi-acetates' in his stride.

It should be said that, apart from verbal peculiarities, the opening chapters of the book are the more readable. As the story moves forward the account gathers in distorting compression so that, for example, the names of Purdie, Irvine, Pringsheim and Kiliani go unmentioned in the history of the carbohydrates and Professor Haworth is credited with researches on 'the chemistry of hydrocarbons' (p. 248)! The brief sections dealing with industrial chemistry are too fragmentary even to serve as an introductory outline and they contain a number of statements of which that on p. 226—'potassium chloride is also produced by electrolysis'—is not the most misleading. The text is not relieved or enlivened by either plates or diagrams.

D. W. F. HARDIE

## Will

Dr. Harold Allden Auden, D.Sc., who spent most of his career with the United Alkali Co. and the Distillers Company, and who died on 15 March, left £10,420.

## Chemist's Bookshelf

# Qualitative Inorganic Analysis

QUALITATIVE ANALYSIS AND ANALYTICAL CHEMICAL SEPARATIONS, 2nd Edn. By P. W. West and M. M. Vick. The Macmillan Co., New York, 1959. Pp. xv+302.

This book presents a system of qualitative inorganic analysis which, since the first edition appeared in 1953, has found wide acceptance in teaching institutions in the U.S. The first edition of this book was not widely reviewed in this country so that a full review of the present edition is required.

Unlike its predecessor, the present text is presented in standard book form; it contains three distinct parts and an appendix. Part I (some 84 pages) deals with the experimental work to be done in the laboratory; this includes a study of the reactions of the cations contained in the individual groups of the systematic analytical scheme and a short section on the classification and chemistry of the common anions. Part II (20 pages) deals with the theoretical physico-chemical principles upon which the experimental work depends. Part III (50 pages) deals with metals and metallurgy and gives the reactions of 22 metals and metal ions. The 20-page appendix lists the usual chemical constants, solutions required, special reagents, procedures for spot test analyses, and logarithms.

### New Scheme of Analysis

The new scheme of analysis presented in Part I eliminates the use of the classical sulphide precipitations. The elements are separated into six groups. The first group (the Soluble Group) contains sodium, potassium and ammonium; these are detected on a separate portion of the solution for analysis without individual separation. The chloride group containing silver and mercury (I) is separated from hot solution (lead remaining in solution) and the basic benzoates of iron, aluminium and chromium are then precipitated (the Basic Benzoate Group). The acidity adjustment at this stage (pH 3-4) results in the concomitant precipitation of hydrated stannic oxide, and bismuth and antimony oxychlorides. The solution from this group is treated with saturated sodium fluoride to precipitate the fluorides of lead, magnesium and the alkaline earths (the Fluoride Group). The hydroxides of iron (II), manganese, mercury (II), copper, cobalt, nickel and cadmium are precipitated by the addition of caustic soda (the Hydroxide Group), leaving the amphoteric elements, tin (II), arsenic (III) and zinc in solution (the Amphoteric Group). The various group precipitates and solutions are subjected to systematic examination leading to the separation and identification of the individual members of each group.

It is difficult for a reviewer who recommends and teaches a modified classical scheme of analysis which

retains the two sulphide groups to enthuse about this present scheme of analysis. Undoubtedly, from a pedagogic standpoint, any one *workable* system of analysis is as valuable as any other. In this respect, the present text has already proved its value, particularly for students taking general chemistry up to what is probably equivalent to an inter-B.Sc. standard. One feels, however, that the classical sulphide scheme has the advantage of being able to cope with a greater range of elements, if desired, for advanced teaching, and the adoption of the semi-micro scale of working has considerably reduced the unpleasant contamination of laboratory atmospheres so prevalent with the old-fashioned "test-tube and filter-funnel" scale. The section on the identification of anions is suffi-

cient for most students of qualitative analysis.

The remainder of the book follows very much on the standard pattern in so far as the fundamental theory of analytical processes is concerned. This is well related to the practical section and provides the student with the necessary physical chemistry for the correct interpretation of the many reactions he will have encountered during the course of a systematic qualitative analysis. The final part dealing with the chemistry of the metals is useful for students following a course in general chemistry.

It is difficult to imagine the same widespread adoption of this book in this country as in the U.S.; teaching methods differ so considerably. The requirements for the Advanced Level chemistry and equivalent examinations are now too well defined to allow for much deviation from the syllabus. Nevertheless, there is much in this book of interest to teachers of general chemistry, to whom it can confidently be recommended.

WILLIAM I. STEPHEN

## Oscilloscope Polarography

TRACE TECHNIQUES USING THE K1000 CATHODE RAY POLAROGRAPH, VOL. I. By J. Hetman. Southern Analytical Ltd., Camberley, 1959. Pp. 48. Price 25s.

This booklet is a survey of some of the many analyses which can be carried out using the oscilloscopic polarograph manufactured by the publishers. The experiments described are centred around original work by the author and some 30 analyses are described in all. They range from the determination of nitrobenzene in aniline, simultaneous determination of maleic and fumaric acids, *p*-chlorobenzyl cyanide in polymerisation mixtures through to purely inorganic problems such as the simultaneous determination of sodium and potassium in water, cyanide in water, copper, lead and zinc in manganese-brass, etc. In addition, there is a useful bibliography at the rear of the book

which summarises key papers by other workers on each of the 30 experiments.

Judged from the view-point of what it sets out to do, this is a useful publication, particularly for those who possess the instrument, since the text covers a wide range of problems. It is amply illustrated with reproduction polarograms showing results obtained by direct and derivative polarography using anodic and cathodic techniques. Some aspects of terminology are unusual, but they are at least consistent throughout. The textual matter is limited entirely to experimental procedures and the method of interpretation.

The binding in semi-stiff cardboard is poor for the cost and it is liable to fall apart on first opening the book. The cost of the book is far too high.

T. S. WEST

## Chemistry of Organic Compounds of Silicon

ORGANOSILICON COMPOUNDS. By C. Eaborn. Butterworths, London, 1960. Pp. x+530. 80s.

The chemistry of organic compounds of silicon is a rapidly growing subject and one of considerable commercial importance. The present volume is intended to serve both as a comprehensive introduction to the field and as a reference work for those already actively researching in it. The author has succeeded admirably in achieving these ends: his book will be of interest to all chemists and indispensable to many. From the general academic point of view the treatment is most adequate in its detail, but such subjects as the industrial aspects of silicones are, perforce, only outlined. The author has, however, been careful to provide full review and literature references, in this instance and in any others where space

restrictions have precluded a further treatment.

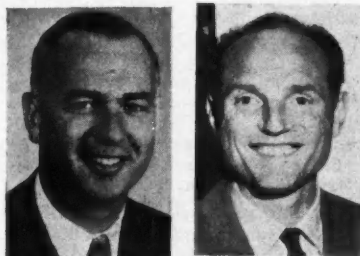
The scope of the book is best indicated by the table of contents. The first three chapters are of a general introductory kind and deal with history, nomenclature, general preparative methods, stereochemistry, and bond properties. These are followed by chapters on: reactions of silicon-carbon bonds; organo-silicon halides; organo-silicon hydrides, organo-silicon pseudohalides; compounds with Si-O, Si-S, Si-N, Si-Si, and Si-metal bonds; cyclic organo-silicon compounds; carbon-functional organosilicon compounds; silicones and other organosilicon polymers; some physical properties; analysis.

The book is thoroughly documented, is well produced, and has an extensive subject index. It is worth the money.

HENRY MACKLE

● **Sir Peter Roberts, Bt., M.P.**, chairman of Newton Chambers and Co. Ltd., Thorncliffe, has been appointed deputy chairman of Ronuk Ltd., the recently acquired subsidiary. **Mr. S. L. Waide**, director in charge of the Chemicals Division of Newton Chambers, becomes Ronuk's vice-chairman; **Mr. P. J. C. Bovill**, managing director of Newton Chambers, with **Mr. F. R. James**, general sales manager, and **Mr. D. Needham**, commercial manager, both from the Newton Chambers Chemicals Division, all become directors of Ronuk. **Mr. R. J. V. Wheeler**, secretary of Newton Chambers, has been appointed secretary of Ronuk, and **Mr. W. Rampton**, formerly secretary, is now assistant secretary. Chairman of Ronuk is **Mr. C. E. M. Hardie**; managing director is **Dr. W. Fowler Felton**; **Mr. J. R. Morris**, another former director, is also on the board.

● **Mr. T. H. Makepeace** has been appointed manager industrial developments at the London head office of Chemstrand Ltd. He was formerly works manager at Chemstrand's fibre plant at Coleraine, Northern Ireland. He took the new plant over from the contractors and was responsible for pioneering the production of acrylic fibre in this country. Mr. Makepeace will be responsible for the co-ordination of all future developments of the company. This is a new appointment which has been called for by the continuing growth of sales of Acrilan acrylic fibre. **Mr. John J. Sosa** is to become works manager for operations at the Acrilan plant at Coleraine. A U.S. citizen, he was originally on a secondment from Chemstrand Corporation, the U.S. parent company, but has now joined the staff of Chemstrand Ltd. and his new appointment is for an indefinite period.



T. H. Makepeace (left). Right is Dr. Symons on a recent visit to the Gulf Oil laboratories at Pittsburgh

● **Dr. M. C. R. Symons, Ph.D., D.Sc. (Lond.), A.R.I.C.**, lecturer in chemistry at Southampton University since 1953, has been appointed Professor of Physical Chemistry at Leicester University. Educated at the John Fisher School, Purley, and at Battersea Polytechnic, he took his B.Sc. in 1945 after which he served for three years with the Royal Engineers. He returned to Battersea as a member of the staff in 1948 and studied for his Ph.D., which was awarded in 1953, when he was appointed lecturer in organic chemistry at Southampton. Since then Dr. Symons has swung

## PEOPLE in the news

towards physical chemistry, particularly spectroscopy and magnetochemistry. In collaboration with a team of research students, he has done research in the fields of unstable intermediates, including carbonium ions, halogen cations and free radicals; the structure and reaction of oxanyons, including such ions as  $\text{MnO}_4^-$  and  $\text{CrO}_4^{2-}$ , etc., and the use of spectrophotometry in the study of ion-solvent and ion-ion interactions in solutions. More than 60 papers or reviews in these fields have been published.

● At a special ceremony to be held during the British Association annual meeting, an hon. D.Sc. in the University of Wales, will be conferred on **Dame Kathleen Lonsdale, D.B.E., F.R.S.**, head of the Department of Crystallography, University College, London. The ceremony will take place at the City Hall, Cardiff, at 6.15 p.m. on 5 September.

● **Dr. Alexander Lewis, Jr.**, who has been elected vice-president of the Gulf Oil Corporation, Pittsburgh, was formerly manager of the Gulf Oil petro-

chemicals department. In his new position, he will continue to direct the company's world-wide petrochemical interests, which include the manufacturing and marketing of ethylene, propylene, benzene, toluene, iso-octyl alcohol and detergent raw materials.

● **Mr. Frederick Baillie**, who joined Cambridge Instrument Co. Ltd., 13 Grosvenor Place, London SW1, as production manager on 2 August, will be responsible for all aspects of production planning at the three U.K. factories.

● **Mr. B. J. Storrar** has been appointed sales manager of Edwin Cooper and Co. Ltd., a member of the Castrol Group specialising in the production of lube-oil additives and other chemicals.

● **Mr. Harold Ernest Ashton**, a senior chemist with CIBA-Clayton Ltd., Manchester, retired on 6 August, after 45 years' service. He joined the company on leaving school and since 1950 has been a departmental manager in the Production Division.

● **Mr. A. E. Allcock** has been elected chairman of the Plant Lining Group of the Federation of British Rubber and Allied Manufacturers for 1960-61. **Mr. T. H. Brooke**, managing director of Redferns (Bredbury) Ltd., has been elected vice-chairman.

● **Mr. M. D. Taylor**, of the Department of Chemical Engineering, King's College, University of Durham, has been awarded a research scholarship to the value of £450 a year (for two years in the first instance) under the C.I.B. Scholarship scheme administered jointly by Constructors John Brown Ltd. and The Institution of Chemical Engineers. Purpose of the scholarship is to encourage research in chemical engineering and, in particular, in chemical plant design.

## Jury Returns Open Verdict on I.C.I. Huddersfield Explosion Fatality

RESEARCH workers of I.C.I. are still trying to find the cause of a violent explosion in an autoclave at the company's Huddersfield dyestuffs factory, which, as reported in CHEMICAL AGE on 23 July, killed a process worker, Mr. K. Ellis. At an inquest in Huddersfield the jury returned an open verdict, the foreman stating that there was nothing to show the cause of the explosion.

The explosion, which occurred in the nylon section of the factory, shattered the steel vessel and demolished a wall. Ellis was said to be standing only 2 ft. from the autoclave when it exploded. Dr. D. Guest, who said Ellis died from shock after multiple injuries, said: "Practically every bone in his body was broken and death would have been instantaneous. The blast must have been terrific, like that of a bomb." Mr. S. Marriage, an industrial chemist with I.C.I., stated that the autoclave was being cleaned with nitric

acid at the time. The process has been used and improved on by I.C.I. for 20 years. He added: "There must have been a sudden chemical reaction. Our research department is still trying to find the cause." Heat and pressure built up inside the autoclave when it was being cleaned with the acid, but it had a vent pipe which was still in working order after the explosion. It was stated that Ellis was found lying on the ground floor near the autoclave. Before the explosion both he and the autoclave had been on the top landing of the shed. A charge-hand said that just one minute before the explosion he took the temperature of the autoclave, and it was only 80°.

Mr. Stanley Bryan, late managing director of Killgerm Co. Ltd., and associated with the Mirvale Chemical Co. Ltd., who died on 4 April last, left £17,325 19s. 5d. net (duty paid £1,734).

## Commercial News

### Anchor Chemical

Abnormal increases in both home and export sales for the first six months compared with the same period of last year are referred to by Mr. T. Martin, chairman of Anchor Chemical Co. Ltd., in his first interim report. Group profit after all charges but before tax for the six months ended 31 May was £125,881, 39% higher than a year earlier. An interim of 6% is declared on ordinary. The second half of the trading year is expected to result in lower trading figures in what is the main holiday period.

### East India Distilleries

Details have been released of arrangements for financing the £3-million factory of East India Distilleries and Sugar Factories Ltd., at Ennore, near Madras, which, as reported in CHEMICAL AGE, 25 June, p. 1069, will produce about 51,000 tons/year of ammonium phosphate-based fertilisers. The company recently announced a rights issue of 550,000 £1 ordinary shares; proceeds of about £820,000 will help to finance the Ennore project. In addition, £600,000 will be raised by the issue of debenture stock to the Commonwealth Development Finance Co., and £250,000 will be advanced by Simon-Carves, who are contractors for the plant. A further advance of about £1.35 million will come from the State Bank of India.

### New Austrian Oil Venture

A new oil processing company, working on a non-profit making basis, has been set up in Austria under the name of Österreichische Rohölverwertungsgesellschaft mbH. Shareholders are Österreichische Mineralölverwaltung, with 74% of the company's 1,000,000 Schilling capital, Shell Austria with 13%, and Mobil Oil Austria with the same amount. The joint company, headed by one director from each shareholding company, will be responsible for the processing of crude oil into hydrocarbon products at the Austrian refineries of the three holding companies. Although the body will be concerned with the type and quality of products manufactured, it will be in no way connected with the marketing of the products.

### Farbenfabriken Bayer

Farbenfabriken Bayer AG, Leverkusen, W. Germany, have issued DM75 million (£6½ million) of new bearer shares, this rise provided for by a capital increase announced in January.

### B.P. Benzin und Petroleum

B.P. Benzin und Petroleum AG, Hamburg, the German member of the British Petroleum group and 50% owner of the German petrochemical company, Erdölchemie GmbH, Dormagen, announce a total turnover of DM1,300 million (DM916 million) for the 1959 financial year. Despite record sales, how-

- Anchor 6-months Profit Up By 39%
- Simon-Carves Finance for Fertiliser Project
- Bayer Issue £6.25 Million New Shares
- Monsanto Turnover Higher By \$28 Million

ever, a loss of DM1,640,000 was registered for the year. The loss recorded for 1958 was DM8,420,000. When the Dinslaken refinery of the company is brought on stream, B.P. Benzin und Petroleum will have a total potential oil refining capacity of 6 million tonnes annually. The current financial year, in which some DM150 million will be invested by the company, is expected to have a final result similar to that for 1959.

### Europa-Chemie Fund

Europa-Chemie, a chemical share investment fund operated in Basle by the Swiss company, Gesellschaft für Internationale Anlageverwaltung, states that in the period from its foundation (1 April 1959) to 30 June 1960, it has issued some 123,000 investment share coupons. In the 15-month period the fund has grown to a worth of Sw. Fr.20,080,000 (£1,670,000), of which Sw. Fr.2,030,000 are in liquid form. Value of a Europa-Chemie coupon is now Fr.163.22. Of the fund's moneys invested in scrip, about 28% are accounted for by Swiss interests, 19% by West German, 15% by French and 11% by Italian. With a net profit for the period of S. Fr.616,230, the fund is to pay a net dividend of S. Fr.4.20 per coupon.

### General Aniline and Film Corp.

General Aniline and Film Corp., U.S., announce a net profit of \$3.6 million, or \$4.51 per share, for the first half of this year, as against figures of respectively \$3.5 m. and \$4.44 for the first half of 1959. Sales rose by 5% over the period, from \$76.7 m. to \$80.6 m.

### Hercules Powder Co.

Hercules Powder Co., Wilmington, Delaware, announce a profit per share of \$1.51 in the first half of the current year, as compared with \$1.36 dollars in the first six months of 1959. Sales increased over the period from \$137.2 million to \$160.5 million.

### Monsanto Chemical Co.

Turnover of the Monsanto Chemical Co., including that of foreign subsidiaries and the Monsanto share in associated companies, totalled \$431,790,000 in the first half of the current year (\$413,710,000). Despite higher sales, net profits fell by some 5% over the period from \$35,210,000 to \$33,490,000, or from \$1.52 to \$1.45 per share.

### I.G. Farben

I.G. Farben AG, the former German chemical giant now in liquidation, announce a provisional liquidation surplus of DM15.3 million (DM14.5 million) for the 1959 financial year. Actual surplus for 1959 was DM12.5 million (DM13.1 million). Claims still

resting with the liquidated concern from the three I.G. Farben successor companies total DM135 million, for sums claimed by former concentration camp inmates. A sum of DM17.6 million is still in reserve for payment of claims by the Conference on Jewish Material Claims against Germany.

### Chas. Pfizer

Turnover of Chas. Pfizer and Co., U.S., in the first half of the current year is up by 11% and profits by 13% on the same period of 1959. Net profit totalled \$12.9 million (\$11.4 m.), or 78 (69) cents per share, and world sales \$36.8 million (\$122.9 m.).

### INCREASE OF CAPITAL

LEEDS CHEMICAL CLEANING WORKS LTD., Apperley Bridge Works, near Bradford. Increased on 22 January, by £81,030, in £1 Ordinary shares, beyond the registered capital of £30,000.

### NEW COMPANIES

CHEMICAL AND EXPORT PACKING LTD. Cap. £500. Specialists in the packaging of chemicals, etc. Directors: C. T. and K. Parfit. Reg. office: 119 The Chine, London N.21.

ODEX MANUFACTURING LTD. Cap. £10,000. Manufacturers of and dealers in chemicals, etc. Reg. office: Cromwell Road, Ellesmere Port.

STRESS RELIEVING SERVICES LTD. Cap. £100. To manufacture and deal in industrial plant, installations and equipment, pipes and pipe lines and machinery, plant and equipment for use in oil, chemical, gas, atomic and other installations, to undertake the pre-heating and stress relieving of pipes, pipe lines and other equipment, etc. Directors: D. W. Blakley, Marion N. Blakley. Reg. office: 31/2 Haymarket, London S.W.1.

FREDERICK TYRRELL AND CO. LTD. Cap. £1,000. Manufacturers of and dealers in chemical and animal feeding stuffs, etc. Directors: F. Tyrrell and F. Higson. Reg. office: Trelco Works, Dawes Street, Bolton.

WALLERSTEIN CO. LTD. Cap. £100. Chemists, druggists, importers, exporters, manufacturers of and dealers in pharmaceutical, medicinal, chemical, industrial and other preparations, etc. Directors: A. T. Wheeler, J. F. Potton, C. A. Schwartz (all directors of Baxter Laboratories Ltd.) and A. C. Emelin. Reg. office: 26 Gt. Tower Street, London E.C.3.

WHEELER AND HUISKING LTD. Cap. £100. Importers and exporters of drugs, chemicals, oils and spices, etc. Directors: A. T. Wheeler, J. F. Potton, C. A. Schwartz and A. F. Courcha. Reg. office: 26 Gt. Tower Street, London E.C.3.

# NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

## ACCEPTANCES

### Open to public inspection 14 September

- Apparatus and process for the conversion of gaseous fuels. Compagnie Generale de Construction de Fours. [Addition to 781 370.] **847 618**
- Production of a photographic material on aluminium and its alloys. Interlupa. **847 827**
- Production of a carbon black. Texaco Development Corporation. **848 419**
- Process for separating niobium and tantalum from each other. Ciba Ltd. **847 829**
- Process for roasting sulphide ores. Chemiebau Dr. A. Zieren G.m.b.H. **847 623**
- Process for the manufacture of aliphatic dicarboxylic acids. Filmfabrik Agfa Wolfen Veb. **847 621**
- Polyamine resins. Pittsburgh Plate Glass Co. **847 833**
- Production of hydrocyanic acid. Otto & Co. G.m.b.H., C. **848 337**
- Fugitive dyestuffs or tints derived from reactive anionic dyestuffs. British Rayon Research Association. **848 459**
- Polymerisation process and products thereof. Esso Research & Engineering Co. **847 661**
- Esters of glutamyl aspartic acid and derivatives thereof. Uclaf. **848 403**
- Polypeptides. Uclaf. **848 404**
- Tripeptide derivatives and process of production thereof. Uclaf. **848 405**
- Tripeptide and tetrapeptide derivatives. Uclaf. **848 406**
- Production of oxytocin. Uclaf. **848 407**
- Process of manufacturing coke. Great Lakes Carbon Corporation. **847 840**
- Isoquinolines and process for their manufacture. Ciba Ltd. **848 341**
- Manufacture of surface-active acrylated hydroxy sulphonates. Unilever Ltd. **848 463**
- Synthetic lubricants. British Petroleum Co. Ltd., Pethrick, S. R., and Sparke, M. B. **847 629** & **847 664**
- Production of beryllium fluoride. Beryllium Corporation. **848 345**
- Steroids. Merck & Co. Inc. **847 844**
- Process for separation of normally solid polymers of 1-olefins from solutions thereof. Phillips Petroleum Co. [Addition to 835 301.] **847 632**
- Preparation of aluminium hydrocarbyls. Goodrich-Gulf Chemicals Inc. **848 103**
- Detergent compositions. Hedley & Co. Ltd., T. **848 224** & **848 225**
- Azo-dyestuffs, containing a triazine nucleus, their manufacture and use. Ciba Ltd. **847 635**
- Process for producing diacetone alcohol. Usines de Melle. **848 347**
- Process for the production of diborane. Studiengesellschaft Kohle. **848 466**
- Process for the manufacture of hydrolyzed vinyl acetate/acrylic ester copolymers. Imperial Chemical Industries Ltd. **848 348**
- Cyanine dyes. Ilford Ltd. **848 016**
- Separation of hydrocarbons. Esso Research & Engineering Co. **848 467**
- Treatment of ferrous material. British Oxygen Co. Ltd. **847 848**
- Compositions comprising a thermoplastic acrylic copolymer and a diglycidyl ether. Rohm & Haas Co. **848 350**
- Starch products and processes for making same. Corn Products Co. [Addition to 807 070.] **847 669**
- Basic chromic chlorides. Diamond Alkali Co. **848 470**
- Organosilicon waterproofing compositions. Hurst, H. **848 352**
- Polyesters and their method of preparation. British Petroleum Co. Ltd., Birch, S. F., Gould, P., and Critchley, S. W. **847 630**
- Dihydric phenols as modifiers for phenyl silicate. Hygrotherm Engineering Ltd. **848 472**
- Hydrogenation. British Petroleum Co. Ltd., Yeo, A. A., and Haresnape, J. N. **848 232**
- Thread made from a polyurethane. United States Rubber Co. **847 673**
- Polymeric compositions. Du Pont de Nemours & Co., E. I. **848 354**
- Process for manufacturing adhered yarn of synthetic linear polymer and product thereof. Toyo Rayon Kabushiki Kaisha. **848 119**
- Chlorinators. Greaves & Sons Ltd., R. **847 674**
- Pigment compositions. Imperial Chemical Industries Ltd. **847 959**
- Process for the polymerisation of vinyl chloride. Imperial Chemical Industries Ltd. **847 676**
- Production of organic oxygen-containing compounds. Imperial Chemical Industries Ltd. **848 245**
- Poly (3-methyl-1-butene) and a process for the preparation thereof. Union Carbide Corporation. **847 686**
- Preparation of alkyl halogenosilanes. General Electric Co. **848 249**
- Process for the preparation of fungicidally active compounds and compositions containing said compounds. Aagrunol Chemische Fabrik N.V. **848 430**
- Method of hydrotreating mixtures of hydrocarbons. Metallgesellschaft A.G. **847 689**
- Sound apparatus for the extraction of dust and dirt from gases or liquids. John, R. **848 437**
- Apparatus for use in chemical analysis. International Analyzer Co. **848 125**
- Methods for improving the physical and mechanical properties of plastic foams. Owens-Corning Fiberglass Corporation. **848 260**
- Quenching and purification of gaseous reaction products. Esso Research & Engineering Co. **847 699**
- Process for the production of foamed polyurethane plastics. Farbenfabriken Bayer A.G. **848 359**
- Basic thio-ethers and their preparation. Pfizer & Co. Inc., C. **847 701**
- Bleaching compositions. Unilever Ltd. **847 702**
- Removal of sulphur from blast furnace slag. British Oxygen Co. Ltd. [Addition to 808 788.] **847 864** & **847 865**
- Process for making plastic ethylene-butene copolymers, and products thereof. Esso Research & Engineering Co. **847 706**
- Benzisothiazolones. Imperial Chemical Industries Ltd. **848 130**
- Anion-exchange process for uranium recovery. United Kingdom Atomic Energy Authority. **848 132**
- Magnesium base alloys. Magnesium Electron Ltd. **848 036**
- Forming of beryllium. United Kingdom Atomic Energy Authority. **848 269**
- Production of aluminium-containing synthetic resins. Chemische Werke Albert. **848 270**
- Process for the manufacture of glass fibre yarns and a size composition for use therein. Owens-Corning Fiberglass Corporation. **848 271**
- Opaque liquid detergent composition. Hedley & Co. Ltd., T. **847 712**
- 19-norsteroid compounds and process for the preparation thereof. Organon Laboratories Ltd. **847 713**
- Manufacture of regenerated cellulose products. Buckeye Cellulose Corporation. **847 714**
- Process for the preparation of terephthalic acid. Imperial Chemical Industries Ltd. **848 284**
- Dipeptide esters and the preparation thereof. Uclaf. [Divided out of 848 405.] **848 408**
- Process of polymerisation of 1-olefins. Hercules Powder Co. **848 285**
- Process for the production of basically substituted derivatives of 4-azophenazines. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. **848 286**
- Purification of pseudo-ionone. Glaxo Laboratories Ltd. **848 287**
- Steroid compounds. Soc. Farmaceutici Italia. **848 288**
- Process and device for the production of lead tetraethyl. Ziegler, K. **848 364**
- Symmetrical bis-amines. Miles Laboratories Inc. [Addition to 791 745.] **848 289**
- Esters of aspartic acid and derivatives thereof. Uclaf. [Divided out of 848 403.] **848 409**
- Purification of olefin polymers. Bataafsche Petroleum Maatschappij N.V. De. **847 733**
- Thermoplastic compositions. Badische Anilin- & Soda-Fabrik A.G. **848 153**
- Processes for the polymerisation of ethylene. Soc. Normandede Matieres Plastiques S.A. **848 182**
- Compounds of the oestrane series and process for the preparation thereof. Organon Laboratories Ltd. **847 890**
- Hydrolysis process. Imperial Chemical Industries Ltd. **848 368**
- Diaryldisulphides containing arylsulphonyl groups. Goodyear Tire & Rubber Co. **848 370**
- Manufacture of polyhydric alcohols from sorbitol. Inventa Aktiengesellschaft Für Forschung und Patentverwertung. **847 745**
- Organosiloxane compositions. Midland Silicones Ltd. (Dow Corning Corporation). **848 373**
- Glutarimide and salts thereof and pharmaceutical preparations containing same. Nicholas Proprietary Ltd. **848 166**
- Carbazinic acid derivative. Olin Mathieson Chemical Corporation. **848 167**
- Titanium base alpha aluminium-columbium-tantalum alloy. Mallory-Sharon Metals Corporation. [Addition to 840 748.] **847 979**
- Device for the use of liquefied petroleum gas in internal-combustion engines. E.N.N.A.M. N.V. **847 752**
- Dimethylbenzyl chrysanthemumates and method of preparation thereof. Benzol Products Co., and McLaughlin Gormley King Co. **848 379**
- Reactor for and its use in preparing melamine. Montecatini Soc. Generale per L'Industria Mineraria e Chimica. **848 381**
- Resolution of racemic threo-β-(p-nitrophenyl)-serine-n-butyl ester. Egeyult Gyogyyszer Es Tapaszgyar. **847 761**
- Production of mono-crystalline bodies. Siemens-Schuckertwerke A.G. **848 382**
- Separation of the elements of air. Air Reduction Co. Inc. **848 297**
- Process for producing alpha olefins. California Research Corporation. **848 385**
- Production of polyesters. Chemische Werke Hüls A.G. **847 767**
- Purification of dimethylformamide. Du Pont de Nemours & Co., E. I. **847 770**
- Antibacterial detergent compositions. Colgate-Palmolive Co. **848 396**
- Process for separating hydrocarbons. Bataafsche Petroleum Maatschappij N.V., De. **848 190**
- N-(1-Naphthyl)-N'-(β-substituted ethyl)-ureas, their preparation and compositions thereof. Pfizer & Co. Inc., C. [Divided out of 845 448.] **847 997**
- Alpha-cyanoethyl polysiloxanes and their production. Union Carbide Corporation, formerly Union Carbide & Carbon Corporation. [Divided out of 847 801.] **847 806**
- Betacyanoethyl polysiloxanes and their production. Union Carbide Corporation. [Divided out of 847 801.] **847 807**
- Process for polymerising siloxanes. Midland Silicones Ltd. **848 311**
- Weedkillers. Schering A.G. **848 392**
- Production of esters of propionylacrylic acid. Badische Anilin & Soda-Fabrik A.G. **848 395**
- Oxidising wetting and detergent compositions. Colgate-Palmolive Co. **848 397**
- Substituted pyrimidines. Chemische Werke Albert. **848 399**
- Δ<sup>4</sup> 2-(4-biphenyl)-hexensic acid and esters thereof. Vismara S.p.A., F. **847 779**
- Steam cracking naphtha hydrocarbons. Esso Research & Engineering Co. **847 781**
- Vinyl halide polymer compositions. United States Rubber Co. **847 782**
- Catalysts containing a hereto-polyacid. Bataafsche Petroleum Maatschappij N.V. **847 784**
- Process of preparing polyethylene and co-polymers of ethylene. Stamicarbon N.V. **847 787**
- Treatment of polyvinyl chloride latices. Bataafsche Petroleum Maatschappij N.V. **848 057**
- Process for the production of enpoly-oxy-methylene with improved heat resistance. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. **848 061**
- Copolymers of unsaturated polyester resins and process for the production thereof. Badische Anilin- & Soda-Fabrik A.G. **848 400**
- Polymerisation process and product. Phillips Petroleum Co. [Divided out of 845 200.] **848 065**, **848 064** & **848 067**
- Process for the recovery of acetylene from gas mixtures. Nitroglycerin A.B. [Addition to 791 362.] **848 279**
- Dipeptide derivatives. Uclaf. [Divided out of 848 406.] **848 410**
- Process for hydroisomerisation of hydrocarbons. Universal Oil Products Co. **848 198**



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### Market Reports

## OVERSEAS DEMAND COVERS WIDE RANGE

**LONDON** Home trade business in the chemicals market during the past week has been of moderate dimensions while the movement against contracts to the chief using industries has not yet been resumed on a full scale.

Prices for the most part are unchanged and steady. A fairly satisfactory overseas demand has been reported covering a wide range of chemical products.

There is little of fresh importance to record with regard to the agricultural chemicals market, and demand for the coal tar products is sufficient to take care of available supplies.

**MANCHESTER** Manchester markets for chemical products this week have been somewhat livelier after the extreme holiday dullness of the previous week. The seasonal influences are still operating and are likely to continue to do so until this month is out. There is a fair

contract movement of the alkalis and other leading lines in the home section at a generally steady range of prices, and shippers are specifying for steady overseas deliveries. Most of the coal tar products, including the light distillates, are finding a ready outlet.

**SCOTLAND** Another quiet week is reported in most spheres of the Scottish heavy chemical market, home business being particularly affected by annual holidays in many areas, although in some instances stocks are being ordered for works reopening after the holiday period. On the agricultural side, as expected, a seasonal quietness prevails, and orders are being received merely for materials for immediate use. The overseas market continues fairly active, with the usual volume of varied enquiries being received. In the main, prices continue steady.

### P.T.F.E.-coated Glass Fabrics by Fothergill and Harvey

A NEW range of polytetrafluorethylene coated fabrics and yarns have been announced by Fothergill and Harvey Ltd., Harvester House, Peter Street, Manchester 2. This Tyglas range of fabrics and yarns, known as Tygaflor, includes two types, A and L, used for the braided surrounds of wires and cables, and for use as sewing threads on heat and chemical resistant fabrics. Tygaflor coated fabrics are made by applying a smooth, uniform and continuous coat of polytetrafluorethylene to woven glass fabrics, and the physical, chemical and electrical properties of glass and the polymer combined give a high dielectric strength, surface arc resistance, resistance to chemicals, except molten alkali metals, fluorine and chlorine trifluoride, and a temperature tolerance from -100 to 250°C. In addition they are said to have a low moisture adsorption, to be completely resistant to weather, and fungus proof.

Type A is used in electrical applications as an insulant and elsewhere for non-stick surfaces, and Type L, specially treated to increase tear resistance, is most suitable for conveyor belts.

### B.P. to Extend Chemicals Research at Sunbury

The Chemicals Division at the B.P. Sunbury Research Centre is a relatively new division and it will carry out research and development on processes to give new or improved chemical products. A considerable recruitment of staff to work on petrochemicals is planned for the next few years and a new laboratory is to be built to house this division. British Petroleum now have an interest in joint ventures with chemical companies in the U.K., France and West Germany.

### Pyrethrum Board and Mitchell Cotts Settle Differences

A SETTLEMENT of their differences over the development of the pyrethrum industry in Kenya has been reached by the Pyrethrum Board of Kenya and the Mitchell Cotts Group in East Africa. They announce the conclusion of negotiations whereby all outstanding claims and disputes are amicably settled and the organisations will co-operate in the future development of the industry.

In coming to this decision, it is recognised by the organisations that the industry, in which each have valuable experience and significant stakes, has an important role to perform in the urgently needed expansion of Kenya's economy and attainment of higher living standards for its people.

Now that the world pyrethrum market can look to a harmonious and stable source of supply, it is hoped that a greater potential for Kenya and Tanganyika production will progressively emerge.

### Cobalt 60 Radiography

Cobalt 60 sources for radiography with the extremely high specific activity of 100 curies/g. are now being prepared by Atomic Energy of Canada Ltd. and are available in the U.K. through the Industrial Division of Watson and Sons (Electro-Medical) Ltd., East Lane, North Wembley, Middx. These sources are made up from nickel plated, cylindrical pellets of cobalt measuring 1 mm. x 1 mm., which are double sealed in welded stainless steel capsules. Main advantage of this material is that the sources prepared from it have extremely small physical dimensions for their output. This enables sharper radiographs to be made or, alternatively, shorter source to film distance to be used, thus considerably reducing exposure times.



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## TRADE NOTES

### Butyl Rubber Compounds

Partially closed cell sponge of exceptionally high tensile strength (100-150 p.s.i.) can be made by blending polythene with butyl rubber. Water absorption of such sponges is 70-110 wt.%. Formulations for such sponges, together with physical properties, are given in technical information sheet No. 35 from Esso Petroleum Co. Ltd., Chemicals Department, 50 Stratton Street, London W.1. Other technical information sheets issued simultaneously are No. 33, dealing with butyl transformer moulding compounds; No. 36, on the compounding of Enjay butyl for dynamic properties; No. 37, compounding for high damping at low hardness levels; and No. 38, on improving stability of butyl latex adhesive dip.

### Epoxy Coatings Price Cut

Increased production from the new CIBA (A.R.L.) epoxy resin factory has led to substantial reductions in the prices of Araldite epoxy resin surface coatings. The new prices came into effect on 1 August; further details are available from the manufacturers, CIBA (A.R.L.) Ltd., Duxford, Cambridge.

### Polythene Sacks for Chemicals

Toughness, high moisture resistance and weather resistance as well as transparency are advantages claimed for Diosacks—heavy-duty sacks of Diothene polythene film now being made by the Plastics Group of the Metal Box Co.

Ltd., 37 Baker Street, London W.1. They are stated to have special advantages for the bulk packing of granular and powdered products. Made from film up to 1,000 gauge (0.010 in. thick) and closed by heat sealing, they can be printed in up to two colours. First users are Monsanto Chemicals Ltd., who supplied the polythene from which the film is made.

### I.C.I. Silicone Rubbers

The Silcoset range of silicone rubbers, with applications including the making of flexible moulds and silicone rubber parts; potting and encapsulating; sealing and caulking; impregnating woven fabrics; and anti-sticking uses; are described in an illustrated booklet published by Imperial Chemical Industries Ltd., Nobel Division, Silicones Department, Stevenston, Ayrshire.

### Change of Address

Midland regional office in Birmingham of Associated Electrical Industries Ltd. has been moved to Gloucester House, 65 Smallbrook, Ringway, Birmingham, 5.

### New I.C.I. Dyes

The I.C.I. Dyestuffs Division has added two new dyes to its range. The first is Durazol Turquoise Blue FB, which gives brilliant turquoise blue shades redder in tone than the turquoise blues of the well established products Durazol Blue 86 and Durazol Turquoise Blue GR to which it is similar in dye-

ing properties. The new dye has, however, the advantage of being superior in wet-fastness properties. Its main use will be in the dyeing of cellulosic fibres.

The second dye is an addition to the Procynyl range, the reactive disperse dyes introduced a year ago. Procynyl Rubine B makes possible the production of deep rubine shades, and is primarily intended for application to nylon and other fibres of the polyamide class. It shows good fastness to wet treatment.

### New Structural Refractories

Monolithic refractories, i.e. mouldables, castables and ramming materials, have for many years been used as stop-gap materials for making temporary repairs or to patch furnace linings temporarily. Their success in this work has led to the development of better grades which can be used as structural refractories in their own right. Such are the Tri-Mor mouldable and castable refractories produced by Morgan Refractories Ltd., Battersea Church Road, London S.W.11, which are described in the company's new publication RD77 (Sec 2).

### Dryers and Furnaces

The company's range of furnaces and dryers are the chief subject of a booklet published by AEI-Birlec Ltd., Tyburn Road, Erdington, Birmingham 24. High-pressure adsorbers for use up to 6,000 p.s.i.g. and process-gas dryers for metallurgical, chemical and petroleum industries, are included in designs offered by the dryer department. The company's heat treatment service is also discussed in the booklet.

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AP 203

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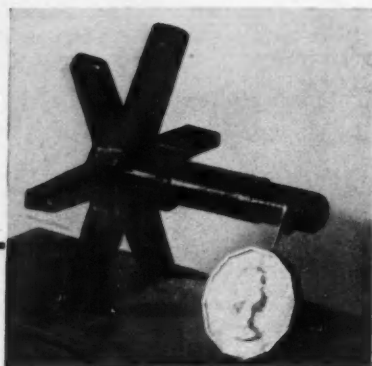
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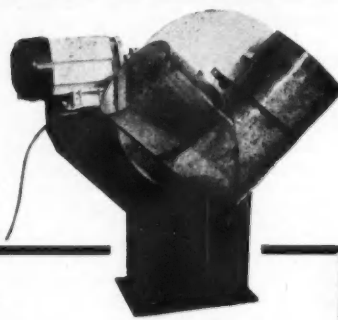
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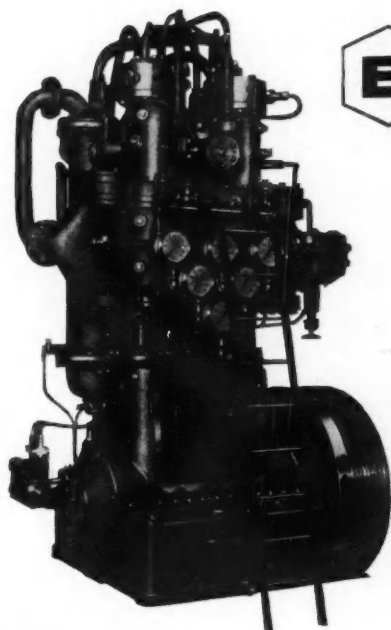
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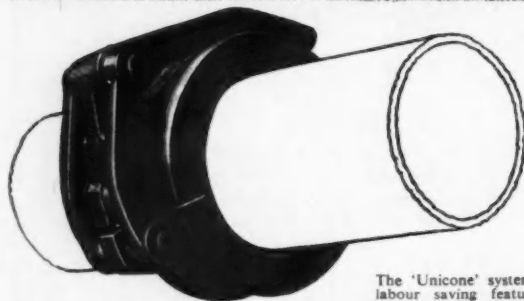
P.O. Box No. 6. WALLSEND, NORTHUMBERLAND

LONDON: 9, BERKELEY STREET, W.1.

Telephone: Wallsend 62-3242/3

Telephone: Hyde Park 1711/2

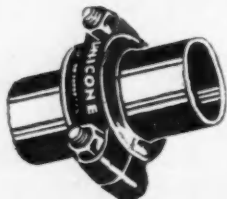
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*Leakproof.  
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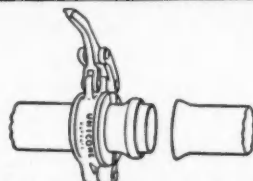
For temporary pipelines 'Unicone' instantaneous joints are recommended. These joints require no tools of any kind, comprise two parts only and fasten with a 'snap' ensuring a perfect seal in a matter of seconds.



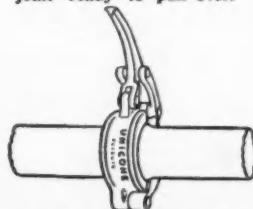
For permanent or semi-permanent pipelines 'UNICONE' bolted pipe joints are employed



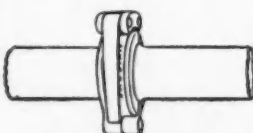
THE UNICONE CO., LIMITED  
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Rubber gasket in position and joint ready to pull over.



Pipe ends joined ready for locking.



The completed joint.

